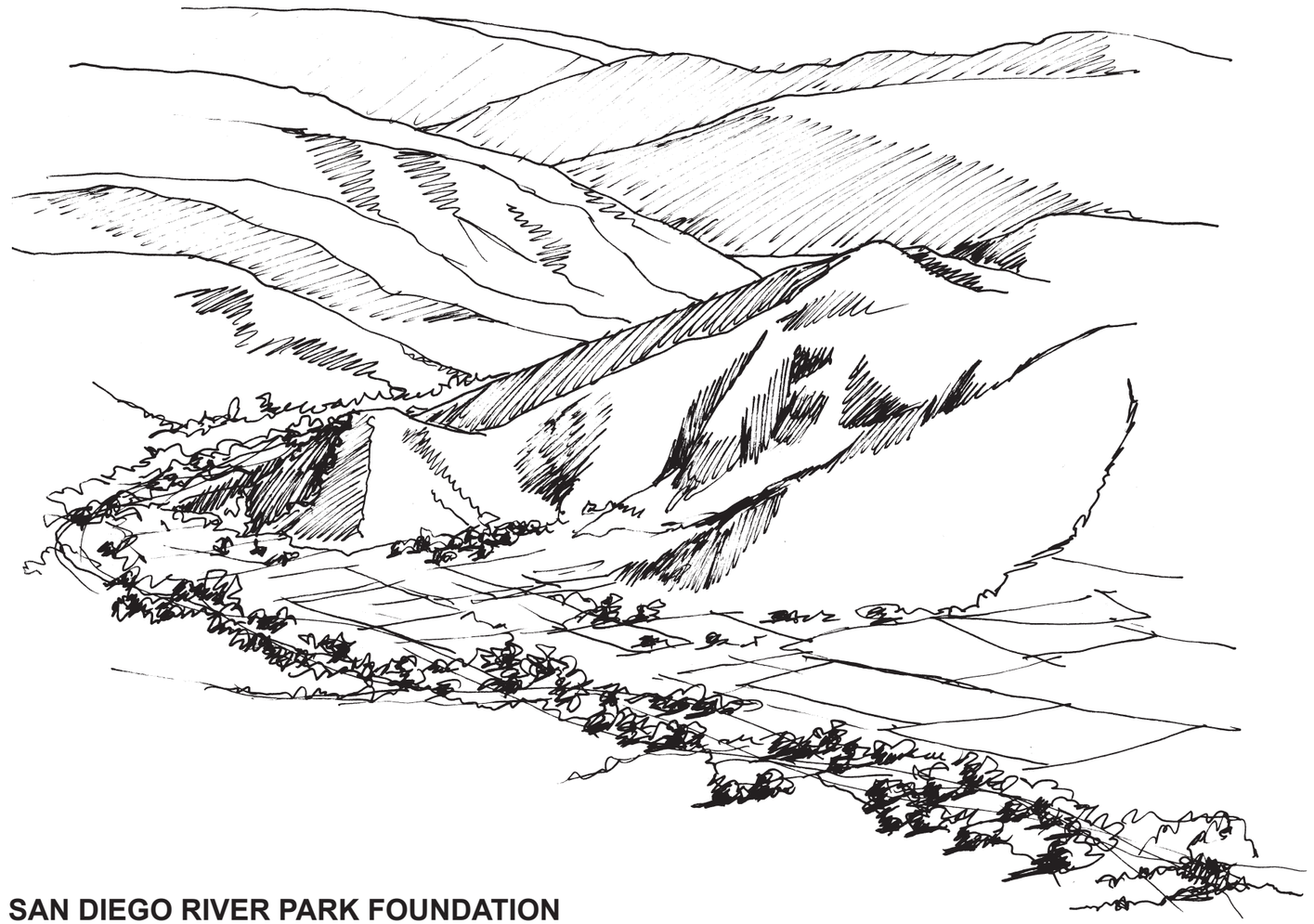
SAN DIEGO RIVER PARK
CONCEPTUAL PLAN



SAN DIEGO RIVER PARK FOUNDATION

The mission of the San Diego River Park Foundation is to support and empower community groups working to restore and enhance the San Diego River and to foster stewardship of this important community and regional asset in perpetuity.

The Foundation works to support important projects which will help to establish a river-long park while restoring and enhancing the river, providing greatly needed community facilities and opportunities to learn about the region's rich history, encouraging stewardship of the riparian environment, and improving the lives of those that live, work and play in the area.

The Foundation is dedicated to making this project a truly treasured regional asset that is valued by all members of the San Diego community. They welcome and encourage everyone who is interested to join in on this effort.

San Diego River Park
Conceptual Plan

Prepared for
San Diego River Park Foundation

Sponsored by
California Coastal Conservancy

Select Committee on Park & River Restoration
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June, 2002

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Board of Directors: Jo Ann Anderson, Michael Beck, Kurt Benirschke, M.D., Charles V. Berwanger, Sandra Ciallela, Janie DeCelles, Thomas DiBenedetto, Sam Duran, James Hubbell, James Peugh, M. Lea Rudee, Ph.D.
Staff: Jo Ann Anderson - Executive Director; Rob Hutsel - Director- Special Projects.

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Community motivation for the San Diego River Park is due in large part to San Diego's Mayor Dick Murphy and the San Diego River Park Policy Committee.

Members: San Diego Mayor, Dick Murphy (Chair);United States House Representative, Susan Davis; State Senator, Dede Alpert; State Assemblymember, Charlene Zettel; State Assemblymember, Christine Kehoe; San Diego; County Supervisor, Diane Jacob; Santee Mayor, Randy Voepel; San Diego City Councilmember, Donna Frye; San Diego City Councilmember, Jim Madaffer; San Diego City Councilmember, Byron Wear; San Diego River Foundation, Jo Ann Anderson.

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Members: San Diego River Park Foundation (Chair),Sierra Club, Audubon Society, Endangered Habitats League, California Native Plant Society, San Diego Baykeeper, Back Country Land Trust, Mission Trails Regional Park Foundation, Mission Trails Regional Park Citizens Advisory Committee, Tecolote Canyon Citizens Advisory Committee, San Diego River Park - Lakeside Conservancy, Cuyamaca Rancho Foundation, Friends of Dog Beach, Friends of Famosa Slough, Friends of Mission Valley Preserve, Friends of Adobe Falls, Navajo Community Planners, Tierrasanta Community Council, Mission Valley Community Council, Ocean Beach Town Council, San Diego County Bicycle Coalition, San Diego Trails Council, Aquatic Adventures, Project Pacific, California History and Culture Conservancy, San Diego Archeological Center, Ramona Trails Association, Urban Corps of San Diego, Founder's Trail Associates, San Diego Stream Team, Back Country Coalition, Mission Valley Unified Planning.

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We are grateful to many members of the San Diego River Community who donated their time and ideas to the project.

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We thank our classmates for their ideas, patience and friendship.
We also thank our families and friends for supporting us throughout our studies.

ABSTRACT

The San Diego River Park Conceptual Plan provides a framework for the establishment of a river park along the length of the San Diego River, located in Southern California. The plan focuses on the stretch of the River from El Capitan Reservoir to the Pacific Ocean at Ocean Beach. A detailed examination of the context of the river, including the cultural context, water resources, plants and animals, and recreation and education provides a foundation upon which the community's vision for the river park, revealed through community workshops and meetings, can be achieved.

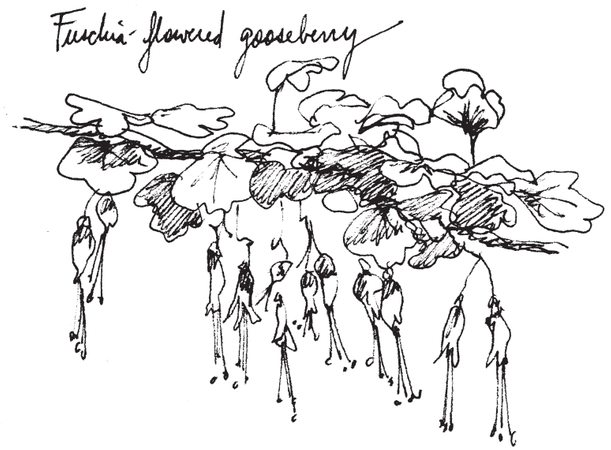
Based on the opportunities developed from the river's context and community involvement, detailed planning goals are developed for the Conceptual Plan. The goals are to preserve and celebrate the river's historic resources, to support the natural stream processes, to preserve and enhance riparian and upland habitat and to provide recreation access and activities.

The Conceptual Plan consists of three components: River Park Framework, Design Patterns and Recommendations. The River Park Framework is developed directly from the planning goals and provides the vision to drive the establishment of the park. Design Patterns are developed to provide a vocabulary for the design and implementation of the river park in which the planning goals can be met. Recommendations for each of the river park's reaches are developed to guide the design, application of Design Patterns, and character of future parks and trails within each distinct reach of the river park.

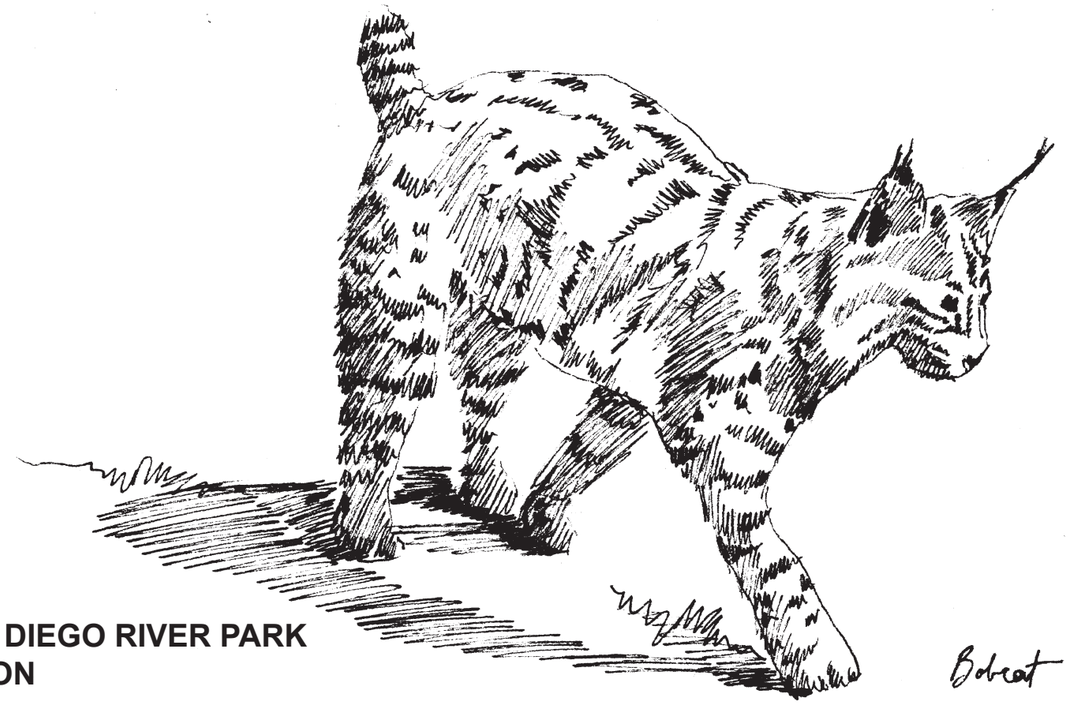
The process of applying the Conceptual Plan components to the design of individual sites within the river park is described. Three site designs on publicly owned land along the river are provided to present a designer's view on what opportunities exist and to illustrate how this process might proceed.

An implementation plan details the steps involved in using this document to guide the creation of the San Diego River Park. Phase One suggests the development of Reach Specific Plans, improvements of existing facilities and community outreach. Phase Two would involve pursuing opportunities for land and easement acquisition, parks and trail development and ongoing community outreach. Phase Three involves monitoring and maintenance and ongoing community support for the established river park.

CONTENTS



Project Orientation

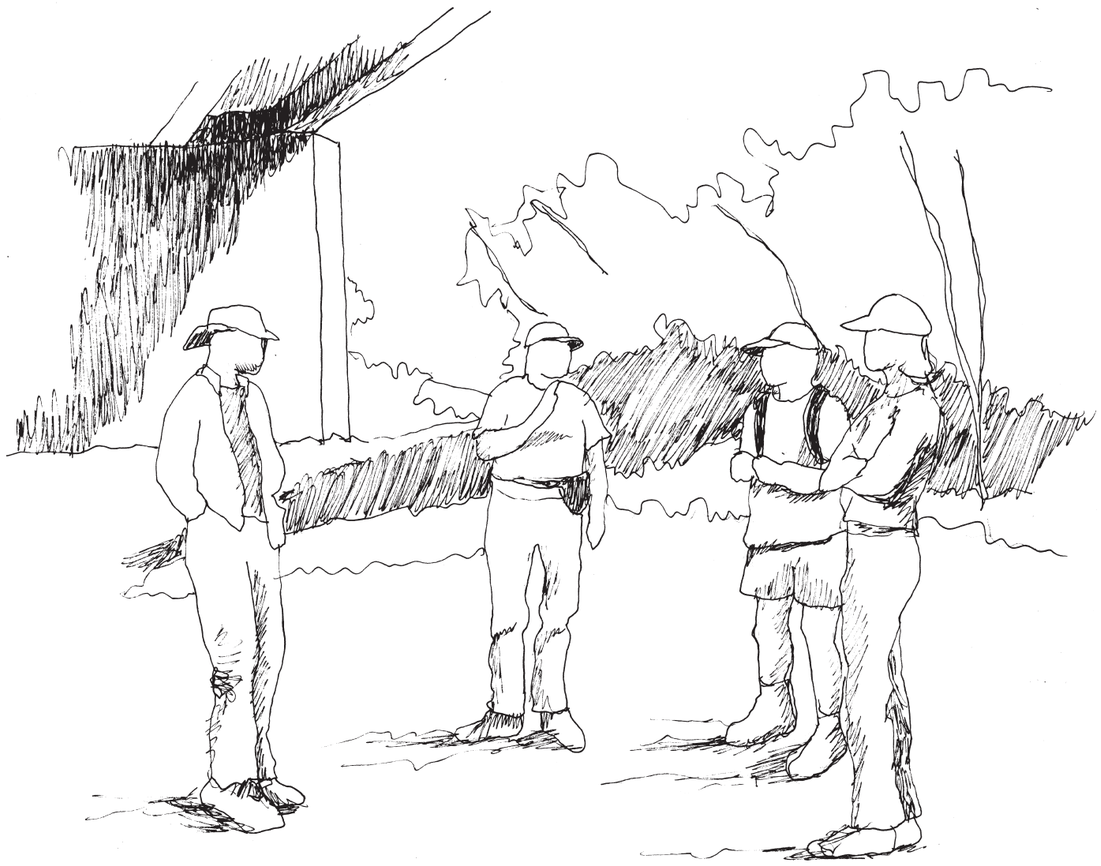


SAN DIEGO RIVER PARK VISION

Today, the San Diego River can be seen as a green ribbon winding its way through steep valleys, agricultural lands, industrial areas, residential developments, and dense urban settings along its journey from the Volcan Mountains to the Pacific Ocean. This green ribbon remains as a remnant of the natural landscape that once carpeted the region, providing a path for rainwater to reach the sea, habitat for native flora and fauna, and recreational opportunities for the people of San Diego County. As San Diego County continues to grow and cities and suburbs replace much of the region's open space, these natural processes and recreational opportunities become increasingly important. Simultaneously, more people and businesses want to be located along the river's edges; competition for use of the land along the San Diego River is increasing.

The time to make decisions about the future of the San Diego River is now, before competition and growth pressures overwhelm the natural processes and recreational opportunities so essential to the character of the region. In response, local citizens, policy makers and nongovernmental organizations have come together to recognize this critical turning point in the history of the river, and to carefully plan for the river's future. This is the birth of the San Diego River Park.

The establishment of the San Diego River Park will offer the public the opportunity to preserve and enhance the river's valuable natural resources by preserving and celebrating the river's rich cultural history, maintaining and improving the flood plain, preserving and enhancing the natural habitat and expanding and connecting recreational opportunities. It will offer mixed uses, throughout a unified park system, based on community values, while recognizing that portions of the river are in private ownership. The green ribbon, growing cleaner and stronger, can serve to connect and unify the local landscape, and serve as a source of local pride well into the future. The San Diego River Park Conceptual Plan serves as a starting point and represents a first step in the process that will bring the proposed river park into reality.



Group tour in Mission Valley Preserve

PROJECT GOALS

The goal of the San Diego River Park Conceptual Plan is to assist stakeholders and community members in shaping their vision for the river park while using holistic, integrated planning and regenerative design principles. The plan seeks to establish a healthy environment for the proposed river park, incorporating both human and natural elements in an integrated and functioning whole.

To meet this goal, this plan seeks to accomplish the following objectives:

1. To conduct a thorough inventory and analysis of the resources and conditions of the San Diego River watershed as a means to understand the possible futures of the river
2. To develop a comprehensive conceptual plan for the river park that reflects the community's desires while maintaining and enhancing the critical natural functioning of the river corridor
3. To develop a series of design patterns and recommendations for use in designing and implementing portions of the San Diego River Park as a unified and functioning system
4. To illustrate the potential application of the conceptual plan in future river park projects by developing, in detail, a designer's view for three key locations within the river park
5. To provide recommendations and guidance for future steps toward the implementation of the San Diego River Park

The historic Mission Dam is a popular destination in Mission Trails Regional Park

ISSUES

The issues involved with designing the San Diego River Park in an established urban, suburban and rural setting are numerous and complex. By separating the issues into general categories based on the three primary future functions of the proposed river park, a clear understanding of the implications of planning and design decisions can be developed. The creation of the San Diego River Park seeks to address and ameliorate these issues.

Historical Recognition

The San Diego River is home to rich cultural history. As long as people have been in the region, they have utilized the resources of the river, and today, many historic sites and artifacts remain along the course of the river. Many sites of historical significance are known and documented, while many layers of history remain obscured. Some sites are well preserved, but others are undergoing rapid deterioration. As development continues to expand in the area, it is increasingly critical to document and preserve these resources before they are lost.

Water Management

The management of water within the San Diego River watershed is a major issue involving complex patterns and relationships. Sediment transport is a critical natural river process that has been compromised by development and alteration of the river channel. Water volume in the river channel has been increased by changes to the landscape and the use of imported water that drains into the river. Water quality has been degraded due to pollution in runoff from developed areas as well as by the leakage of toxins at some sites. The creation of the San Diego River Park can perform a critical role in preserving and enhancing the hydrologic functioning of the San Diego River within the park; failure to do so can lead to continued and increased flooding potential and decreased water quality.

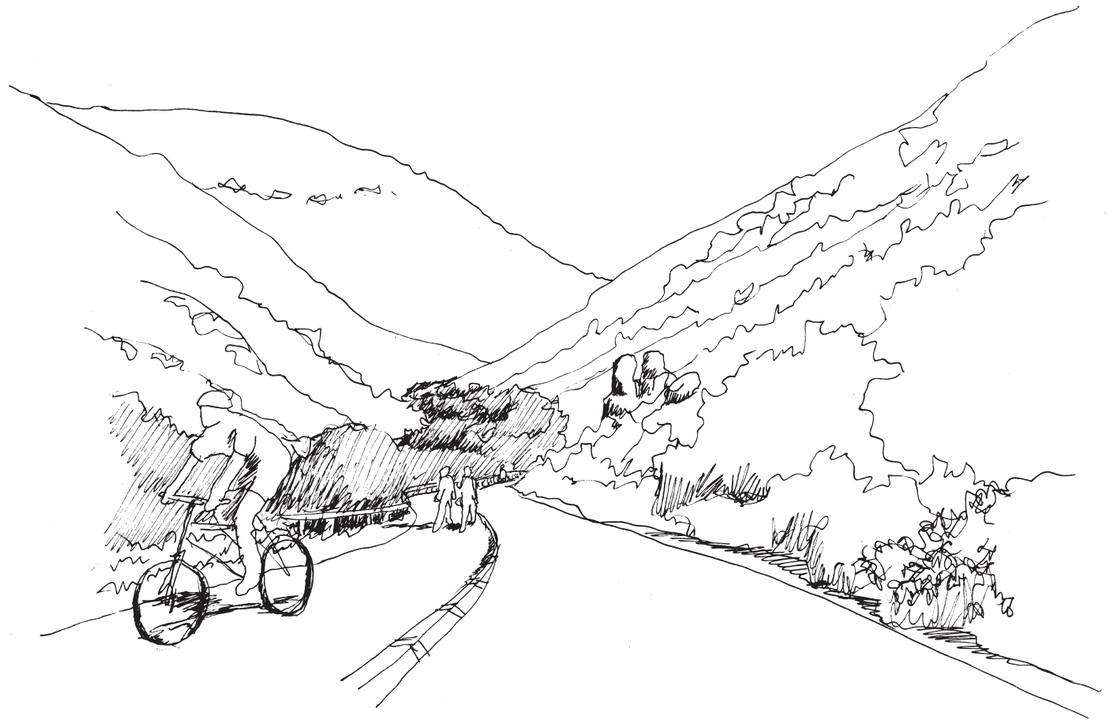
San Diego has an ideal climate for year-round outdoor recreation

Habitat Enhancement

The San Diego River corridor provides critical habitat to native flora and fauna. Dozens of rare, threatened or endangered species utilize the river, finding oasis and protection from surrounding developed areas. The river corridor also serves as an important connector between otherwise isolated habitat patches. Despite current regional protection strategies, the river corridor faces many threats to the native riparian community including invasive exotic species, human interference, degraded water quality and encroaching development. These factors combined threaten to isolate portions of the currently connected river corridor. Maintaining connectivity is critical to maintaining the vigor and health of natural communities.

Recreation and Education

Current recreational opportunities exist in select areas along the San Diego River, but is increasingly difficult to meet all the recreational needs of a growing regional population. Where parks do exist, they remain isolated and separate. Paths along the river are found only in some areas and often do not connect to local parks or to larger regional systems. The San Diego River's unique and long cultural history, as well as its natural character, can offer many opportunities for community education that are currently largely untapped. The San Diego River Park has the potential to maintain and greatly enhance this significant recreational and educational resource for the region.



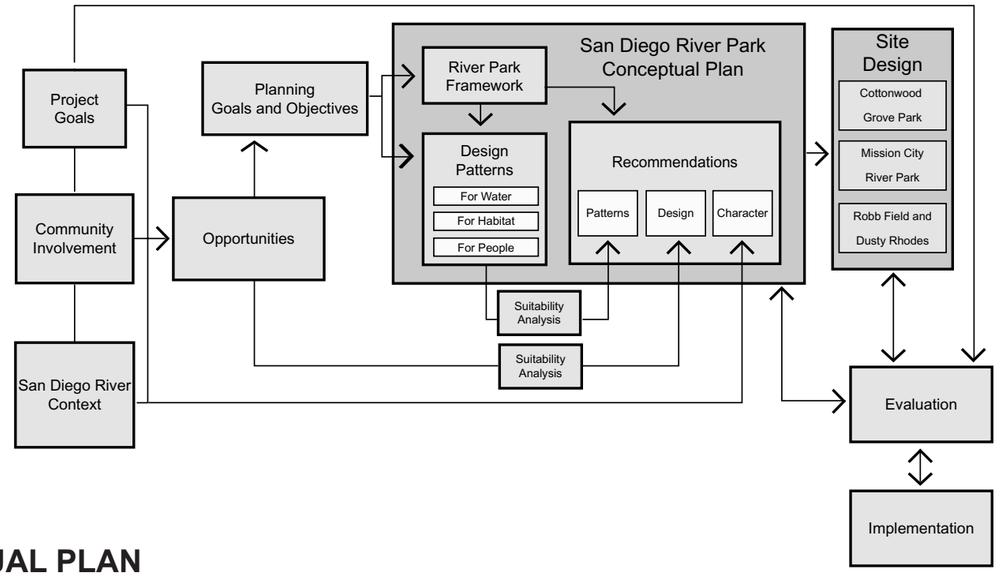
Parks and trails already exist along segments of the river

PLANNING CONTEXT

The planning of the San Diego River Park does not occur in isolation. There are currently many existing planning documents and projects relating to the river (for a comprehensive list, please see Appendix F). Ongoing or potential future projects include an approved specific plan for a furture mixed use development for the Riverfront Golf Course in Mission Valley. The City of Santee is implementing its San Diego River Park Plan covering the length of the river within city limits by 2010. Each plan or project, however, only deals with a single piece or portion of the river. Thus, there is a need to develop an overall vision for the river.

Efforts at viewing the river at a regional scale were limited until now. In the early 1970s, a regional plan for the San Diego area, "Temporary Paradise?," was developed by Kevin Lynch and Donald Appleyard (Lynch and Appleyard, 1974). This visionary plan looked at the region as an integrated system, and sought to plan for the future in a sustainable way. Unfortunately, few aspects of this plan were heeded, and today many of the natural systems in the region, including the San Diego River, have been compromised by rapid development.

Today, people of the region are again looking toward the river's future and considering the regional implications of planning. The first planning document for the entire San Diego River watershed, the San Diego River Watershed Management Plan, is currently under preparation by San Diego County and is anticipated to be completed in 2005. The management plan will address critical watershed-wide issues for the river focusing on water quality, water supply and water quantity, and will be a tremendous resource for the San Diego River Park. Together, these plans for the watershed and for the park will offer great opportunities to preserve and enhance the intrinsic values of the San Diego River for future generations.



Conceptual Plan Process

CONCEPTUAL PLAN PROCESS

This report was generated by the 606 Studio of the landscape architecture graduate program at California State Polytechnic University, Pomona through a close working relationship with our client, the San Diego River Park Foundation. (Please see Appendix K for further details about the 606 Studio design process). Community involvement, including workshops, meetings, interviews and personal contacts, has played an essential role in the development of this plan. The conceptual plan gives shape to a vision of the river park flowing from the hopes, dreams and desires of the local community.

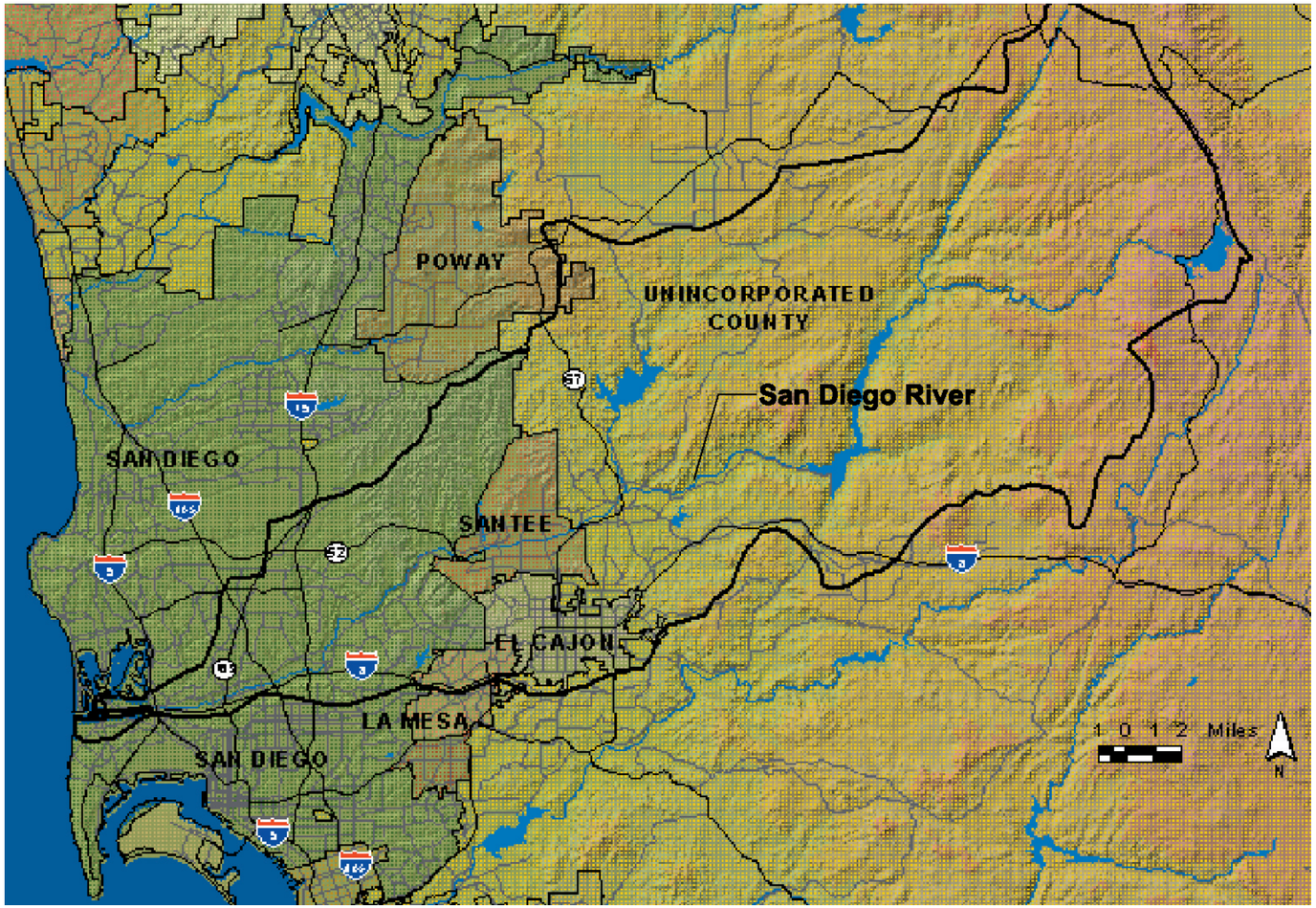
The project process began from the formulation of project goals based on the San Diego River Park Foundation's needs for the conceptual plan. Data collection and analysis occurred through an investigation of the San Diego River context and through community involvement in the planning process. These elements, project goals, context and community input, combined to reveal opportunities for the river park. These opportunities formed the basis for the development of planning goals and objectives, representing specific priorities that can be achieved through this project. The subsequent conceptual plan is composed of three parts: the river park framework, design patterns and recommendations. Flowing from the planning goals and objectives, the river park framework illustrates the vision of a connected and integrated San Diego River Park. Design patterns then provide the tools to achieve these planning goals and objectives in site scale designs in the form of a design language for the river park. Reach recommendations for patterns, design and character are developed to further guide the site design process.

To illustrate the process of applying the conceptual plan to the design of specific sites within the river park, a design process is presented and three selected designs are provided detailing the process.

Evaluation is a critical element of this process, and occurs repeatedly and cyclically throughout the project. Evaluation is based upon a given proposal's ability to meet project goals and the planning goals and objectives. At each step, evaluation occurs to ensure that the planning and design is meeting its stated goals.
This document is meant to serve as a means of guiding the ongoing continued planning efforts for the proposed San Diego River Park and as an example for steering future land use and resource planning toward more sustainable and ecologically viable results. The San Diego River Park Conceptual Plan is a starting point; it is meant to serve as a framework and to provide guidelines for detailed design and implementation. The plan is designed to be flexible and may be adapted to suit changing circumstances.

San Diego River Context

The San Diego River is located in San Diego County, California



The San Diego River watershed

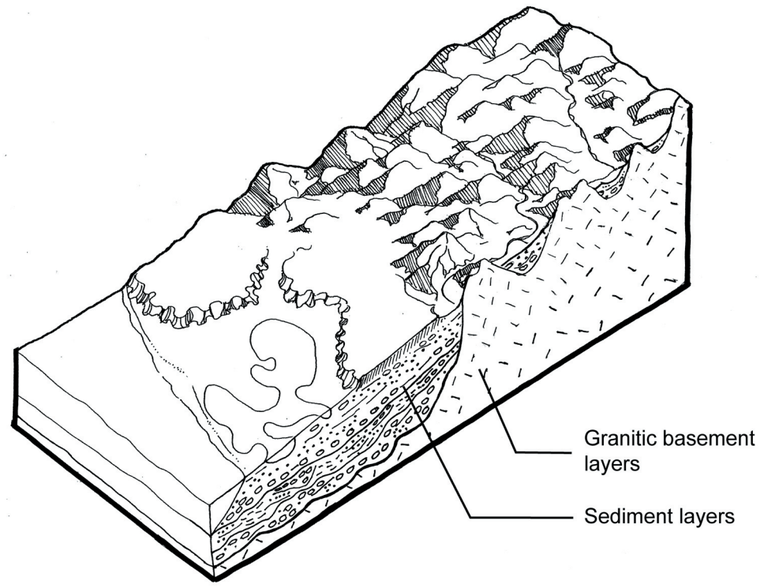
SETTING

The San Diego River and its watershed are located in the Southern California county of San Diego.

San Diego River Watershed

Overview

The San Diego River flows approximately 52 miles from its headwaters located near the towns of Julian and Santa Ysabel in the Volcan mountains through unincorporated San Diego County, the city of Santee, and the city of San Diego to reach the Pacific Ocean at its mouth adjacent to Mission Bay. This study focuses on the San Diego River watershed, including all areas that drain into the river or its tributaries, which covers an area of approximately 440 square miles. Major tributaries to the San Diego River include Boulder Creek, joining the San Diego River in the headwaters above El Capitan Reservoir, San Vicente Creek, joining the river in Lakeside, and numerous smaller tributaries including Cedar Creek in the headwaters, Forester Creek and Sycamore Creek in Santee, Oak Creek in Mission Trails Regional Park, as well as Alvarado Creek, Murphy Creek and Murray Creek in Mission Valley. The watershed covers areas in the jurisdictions of San Diego County and the cities of San Diego, Santee, El Cajon, La Mesa and Poway. Much of the river's mountainous headwaters east of El Capitan Reservoir are located within Cleveland National Forest. The Conceptual Plan will follow the river from the western end of El Capitan Reservoir, all the way to the ocean.

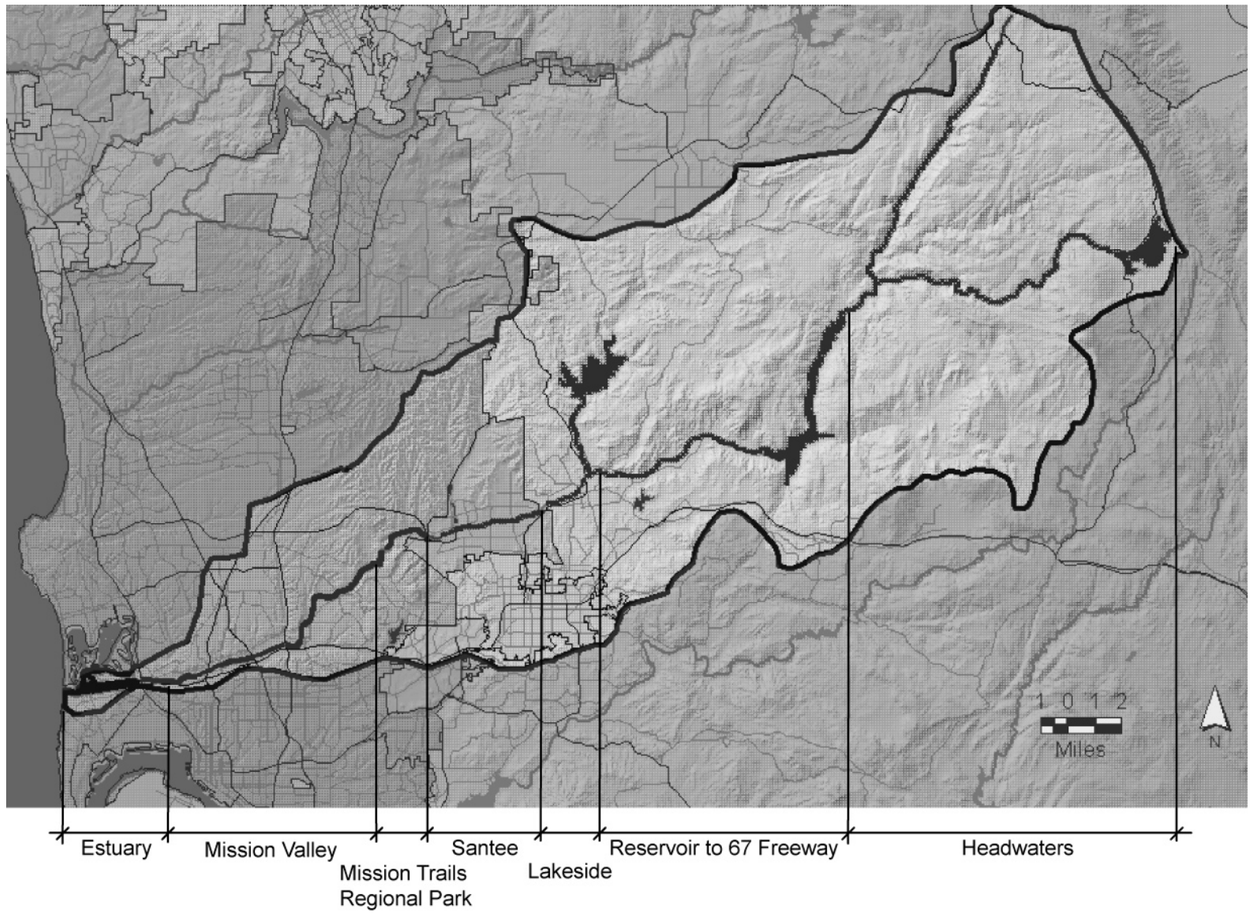


Climate

The San Diego region is naturally arid. The attractive Mediterranean-type climate is ideal for year round outdoor lifestyles with warm temperatures and little rain. County-wide, monthly mean temperatures range from a low of 66 degrees in January to a high of 78 degrees farenheit in August. Coastal areas are generally cooler and low fog is common, while inland areas enjoy more temperate weather and higher temperatures. Rainfall is highly variable in the city of San Diego from year to year, but averages 9.9 inches per year, concentrated in the months from November through March. The inland mountains receive more rain and snow during winter months; the town of Julian, in the San Diego River headwaters, receives an average of 25.9 inches per year. During the dry months of summer to early fall, Santa Ana wind conditions may prevail across the region when hot dry winds blow in from the Mojave desert to the east. During these periods, temperatures can climb to the mid nineties and low hundreds, and humidity is extremely low.

Geology

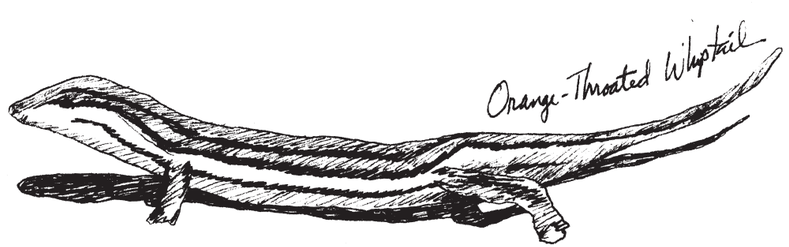
The San Diego area formed as ancient seas and rivers located on granitic base rocks deposited layers of sediment. As the base rocks were pushed upwards millions of years ago, many peaks were formed on the eastern edge of the watershed, such as Cuyamaca Peak (6,512'), and Volcan Peak (5,719'), in the headwaters of the San Diego River. In the western portion of the watershed, ancient seas were receding leaving marine terraces (mesas) upwards of 300 feet above sea level. Stream cutting created the canyon systems in the mesas which can be seen today. One of the most prominent canyons is Mission Valley cutting through the Linda Vista Terrace. As sediment eroded from the eastern mountains and the Pacific Ocean ebbed and flowed through the San Diego River corridor, the valleys were filled with deep layers of sand and gravel. More specifically, the soils in these valleys are made up of sandy loams, clay loams, and clays. Some of the best soils in the region are located in the coastal floodplain making it ideal for agriculture. The communities in the eastern floodplain, such as Lakeside, are very fertile areas comprised of sandy loams and silt loams. Further up in the mountains near Julian, areas of sandy loams on granite bedrock exist in small valleys, but for the most part slopes are steep and consist of rocky outcroppings.

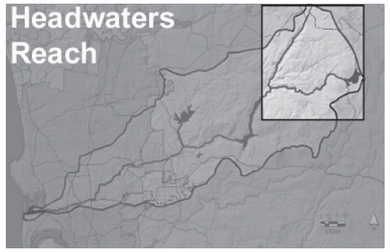


The seven project reaches of the San Diego River

San Diego River Reaches

For the purposes of this study, the river has been divided into seven conceptual reaches based largely on jurisdictional boundaries, land use and topography. These reaches are: headwaters, reservoir to 67 Freeway, Lakeside, Santee, Mission Trails Regional Park, Mission Valley and Estuary. Each reach has unique characteristics, and it is the combination of these characteristics that makes the San Diego River unique.





Rock outcrops and native scrub

Long view down the river's corridor

Day hiking in the Cleveland National Forest

Headwaters

The headwaters, where the San Diego River originates as a small trickle running through a steep boulder-filled valley, remains a largely unspoiled habitat. Much of the headwaters are part of the Cleveland National Forest and other federal land holdings. 23,369 acres of roadless areas in the Cleveland National Forest is proposed for wilderness designation, representing a large portion of the upper watershed that would offer recreational opportunities but be off limits to roads, permanent structures and any mechanized equipment including bicycles. Nine miles of the river in this area is proposed for Wild and Scenic River designation, meaning the river would be preserved in its free flowing condition and that the river and its surrounding environment would be protected for the benefit and enjoyment of present and future generations.

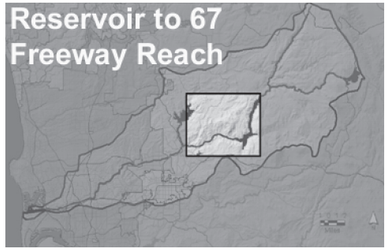
This reach is characterized by a sense of spaciousness and airiness because of the long views through the steep river corridor. The soft edges of the native landscape are punctuated with areas of rock outcrops and strata revealed through natural erosion. The scale is dramatic and a person feels small and insignificant in this large, mountainous portion of the river corridor.

Reservoir to 67 Freeway

The Reservoir to 67 Freeway reach, where the narrow river valley widens into a broad plain with rich alluvial soils, is composed primarily of agricultural land, and the river corridor provides recreational opportunities. Many equestrians enjoy the river along river bottom horse trails, and a golf course, with design techniques certified by the Audubon Society, is under construction along the river just south of the reservoir.

The reach can be characterized similar to the headwaters until El Monte Valley, where the river corridor becomes a cradled valley floor. The vegetation grows more vibrant with a fusion of native vegetation and agricultural fields.

The expansive floodplain of alluvial soils

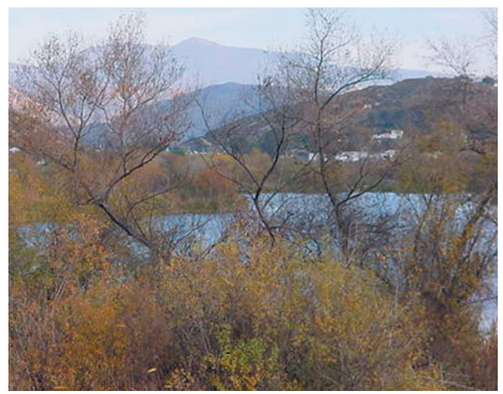


Agriculture remains as the primary land use

El Cajon Mountain above El Monte Valley


Sand mining reclamation ponds


Much of Lakeside's lanscape is barren


Riparian habitat

Lakeside

The rural community of Lakeside in unincorporated San Diego County was built first around agriculture and then the sand and gravel industry. As sand mining operations are coming to an end along the river, light industry and residential neighborhoods are rapidly expanding. To prevent local flooding, the river channel, largely disrupted by mining operations, has been recreated and reinforced by riprap channel walls covered over by native soils and replanted with native vegetation. Native habitat is beginning to return and thrive in these areas.

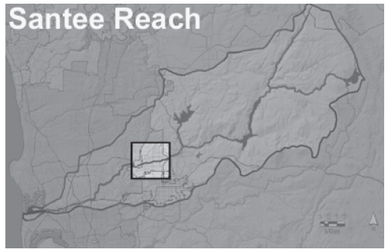
The character of this reach is open and unobstructed because of the expansive horizontal plain which the eye follows until it reaches the edges of the distant, rolling hillsides. These hillsides are dotted with large, smooth rock outcrops jutting out from the pinkish earth.

Santee

The city of Santee takes great pride in the San Diego River which flows through the center of town. Suburban and urban growth surrounds a corridor of natural and urban parks all along the river. There is an increased presence of water in the river here because of the former mining pits that have been remade into the river's bed. When Santee's San Diego River Park Plan is completed, scheduled for 2010, 320 acres along the river will be in public access parkland with six miles of public trails.

Santee's character is dominated by a wide-open valley floor surrounded by low, boulder-strewn hills. The widened river channel increases the sense of openness. The development in the valley along the river is constricting yet pronounces the vastness of the plain.

Suburbs are a close neighbor to the river



Trails in Mast Park

Businesses along the river in Mission Creek

The Mission Dam is a relic of how settlers managed the river

The river's natural meander is evident as it flows through Mission Gorge

The visitor's center features the park's natural and cultural history

Mission Trails Regional Park

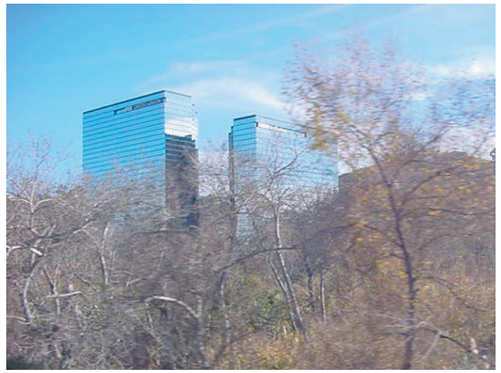
In Mission Trails Regional Park, the river carves through rugged hills and valleys. The park is one of the largest urban parks in the nation with nearly 5,800 acres of natural and developed recreational acres. Historically used by Native Americans and Spanish Missionaries, it is the site of the Old Mission Dam, built in 1809 to store water for the Mission San Diego de Alcala. The two growing urban areas of Santee and Mission Valley surround this heavily used natural park.

The character of Mission Trails Regional Park is bold with uplifting gorge walls and expansive natural vegetation. As one moves through the gorge, they experience a sensation of compression and constriction followed by release and openness. The walls of the mountains are striking with their interesting rock forms and rich colors.

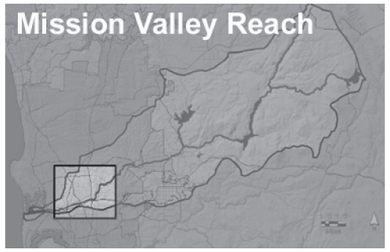
Mission Valley

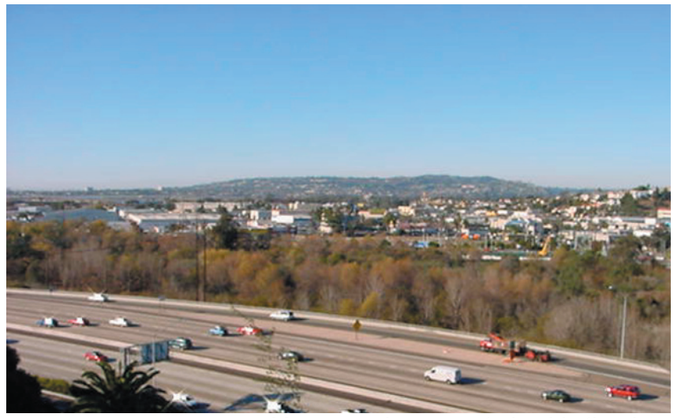
Mission Valley is a densely developed urban area with offices, malls, apartments, hotels, and Qualcomm Stadium. The river, surrounded by development, occupies a narrow corridor through the center of the valley. Water quality issues and flooding from the river are ongoing and frequent problems for this area. Engineering projects, including channelization, were constructed in some areas to decrease flooding potential, and habitat restoration and river trails have accompanied some of these projects.

Here, the area seems enclosed and tight. The scale of elements in this reach is oversized, from the large mesa walls, to the oversized structures such as Qualcomm Stadium and Fashion Valley Mall, to the multiple freeways that loom in the air and on the ground. The adjacent mesa walls that were historically carved out by the river rise almost straight up to hold the river valley in a long corridor. Smooth surfaces such as rock walls, sand and asphalt, dominate the ground plain, and there is a lack of boulders in the landscape, as if they lodged in the gorge at Mission Trails Regional Park. There is a historical character to Mission Valley because of the original and replicated Mission architecture.



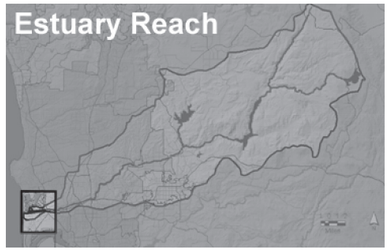
Oversized structures loom above the skyline





Many people commute beside the river,

Water flowing through the heart of the valley



The estuary is rich with bird life

Freeway bridges span the river

The mouth of the river at Dog Beach

Estuary

Where the San Diego River meets the Pacific Ocean at the estuary, the river is channelized, with a levee separating it from the adjacent Mission Bay to the north. Water quality is a significant issue here due to urban runoff and sewage spills occurring throughout the watershed and concentrated here at the river's mouth. At the river mouth lies a very popular recreational area know as Dog Beach where people and dogs come to enjoy both the waters of the river and the ocean. Where the ocean tides and the river waters mingle and salt grasses grow, an incredibly rich and abundant bird habitat exists.

This reach is characterized by openness because of the long horizon of the Pacific Ocean. The reach has a strong coastal feeling, with of ocean breezes and beach lifestyle. The alluvial flows are expressed in the habitat and water paths within the river channel.

CULTURAL CONTEXT

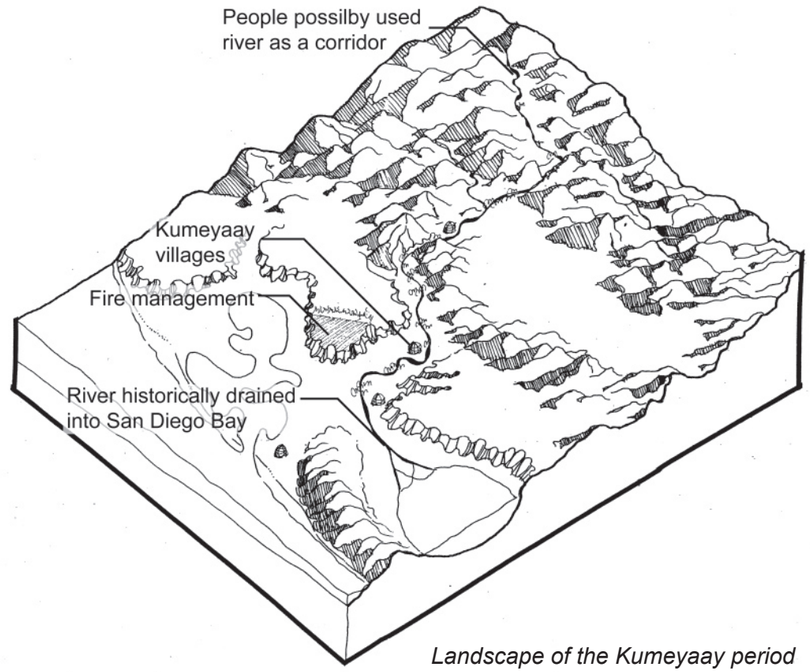
Watershed Changes Through Time

The events and settlement patterns along the San Diego River represent the shift in needs and attitudes about the river through history. The Kumeyaay Native Americans, depended on the river and its resources for their livelihood. The arrival of the Spanish introduced agriculture and grazing while the Mexicans began parceling the land for private ownership. The San Diego region underwent population growth, as California became a major destination for people from the east and Midwest. As people settled, growth spread into areas along the river that were historically set aside for purposes suited for the river's flood plains.

Developments along the river are evidence of the river's role as a water supplier for agriculture and domestic uses and a producer of building materials. As the region modernized the need for the river's natural processes became less a commodity because resources could be imported, and rather the river was often viewed as a destructive nuisance.

Portions of the river have been channelized to varying degrees, allowing for development to exist along the river's edge. Long-term impacts are evident in the degradation of the water quality, loss of habitat connectivity and health as well as a loss of understanding about the river by the people who reside with it. There is a growing movement underway for the awareness of the river's value as a natural system and the multiple benefits that a healthy river system has on the larger environment.

Mission San Diego de Alcala



Landscape of the Kumeyaay period

Kumeyaay Period
(at least 8000 BCE – 1769 CE)

The Kumeyaay lived in temporary settlements dispersed along the San Diego River for at least ten thousand years. They often settled their villages around local springs and water sources. Food, such as acorns and rabbits, was found locally. The river provided materials for their livelihood. Riparian vegetation such as reeds, willows and juncus were made into rafts, house thatching, clothing and baskets. River clay was made into pottery for cooking and storage (Alter, 2002). It is possible they used the river as a corridor when traveling inland to collect seasonal food and trade with neighboring tribes to the east (Christenson, 2002). Fire management was practiced to generate more nutritious grass shoots for their diet and to attract game (Christenson, 2002).

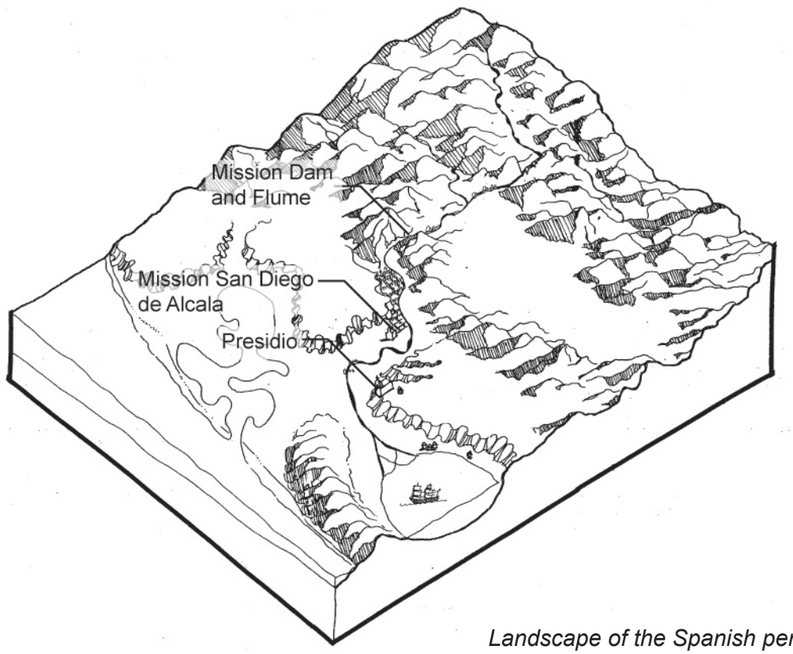
Several known village sites existed along the river, such as Cosoy and Nipaguay, located in Mission Valley, Sinyeweche, located in Santee and Sinyau-Tehwir and Witlimak located in the headwaters. Kumeyaay reservations are located in the San Diego River headwaters today, but unfortunately, much of the historical evidence regarding the Kumeyaay throughout the watershed has been lost.

Spanish Period
(1769 - 1821)

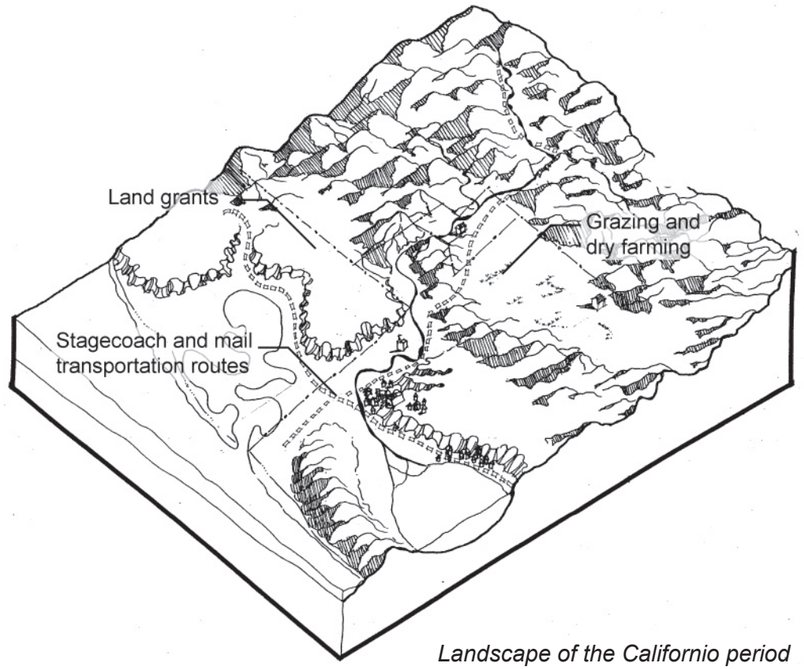
The Spanish arrived in 1769, led by Father Junipero Serra. Along the San Diego River the Franciscan missionaries established what would be the first in a chain of twenty-one missions in California. They built their first mission and presidio on a hillside above the Cosoy, a Kumeyaay village, which was located along the river near today's Old Town. Many Kumeyaay were converted to Christianity and they provided labor to build and sustain the mission. This was the first European settlement on the West Coast of the United States and Canada. Five years later, the Mission San Diego de Alcala was reestablished 5.5 miles upstream above Nipaguay, another Kumeyaay village, due in part to better-suited agricultural land nearby.

The Spanish introduced cattle and used the local trees as lumber for their buildings. In order to irrigate their crops, the mission built a dam at the river's entrance to the gorge, approximateley six miles further upstream. A gravity-fed flume was also constructed to transport the water to their crops and livestock (Alter, 2002). They stopped the Kumeyaay's practice of burning the grasslands, which subsequently converted to chaparral. The cattle preferred the annual bunch grasses for their food and the nonnative carpet grasses brought by the Spanish spread (Christenson, 2002).

A small pueblo began to develop around the first mission and presidio, which later developed into Old Town. Cultural landmarks from this period are present today mainly in the river's lower valley. These sites include the Mission Presidio and Mission San Diego de Alcala State Historical Landmarks, Mission Dam and Flume National Historic Landmark and Old Town San Diego State Historic Park.



Landscape of the Spanish period



Landscape of the Californio period

Californio Period
(1821 - 1848)

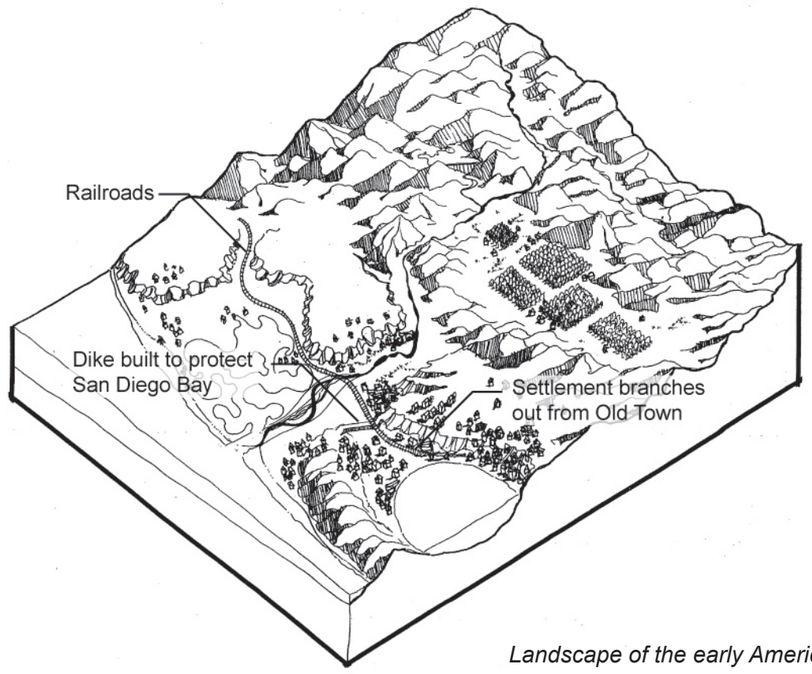
Mexico broke away from Spanish control and governed California from 1821 until 1848. By the 1830s, the missions were secularized, became stagnant and the Kumeyaay villages disappeared. Because of a lack of money from the war, the Mexican government reimbursed their soldiers through the distribution of land grants. Segments between landscape features were designated on rancho maps to delineate the property boundaries. Families built ranchos and the valleys were primarily used for large scale ranching and dry farming. As the region grew, transportation routes began to spread outward by stagecoach and a transcontinental mail route was established along a portion of the river's corridor (Christenson, 2002).

Early American Period
(1848 – 1945)

The city and county of San Diego were established in 1850 when California acquired statehood. Many of the ranchos exchanged hands when the government began taxing landowners. Changes occurred throughout the region and many developments took place within the watershed that changed the structure and function of the river forever.

As settlement expanded, the San Diego Bay became a major West Coast shipping port, the Army Corps of Engineers constructed the Derby Dike in the 1850s in order to prevent silt build-up in the bay. The Derby Dike permanently diverted the river to False Bay, today known as Mission Bay. This was one of the first major projects undertaken by the federal government in California.

A main commercial area began to develop south of Old Town and was dubbed New Town, which is the location of today's main business district. The town of Julian located near the river's headwaters experienced its short-lived gold rush when gold was discovered in 1870 (Pryde, 1992).

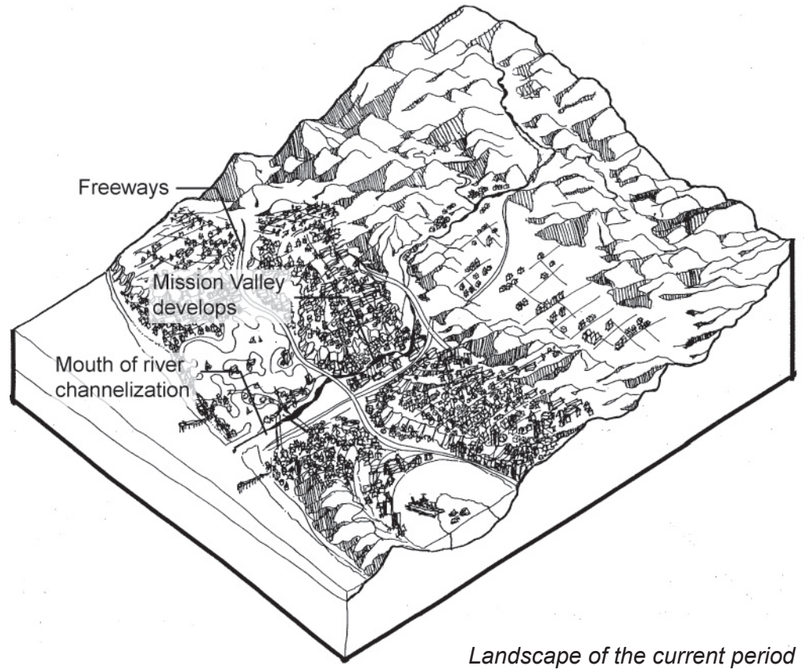


Landscape of the early American period

The agriculture lands in Lakeside began to transform into residential areas. The county established Indian reservations in 1875 in the upper valleys and later relocated them in the upper watershed when the reservoirs were later created. In 1885, the Santa Fe Railroad arrived which expedited trade with outside regions. Materials from the river were used to build some of the area's large infrastructure projects such as dams, the jetty in Mission Bay and railroads.

As population levels increased, so did the construction aggregate and sand mining industry along the river (Abbott, 1991). During the 1880s, the county's population grew from 8,000 to 35,000 residents. The need for water grew and ground water from Mission Valley became insufficient. A flume was built from the Cuyamaca Reservoir and local streams were dammed (Pryde, 1992). The Cleveland National Forest was established to protect the watershed's resources from mismanagement (www.gorp.com).

By the end of the 1800s, irrigated agriculture was widespread. In order to meet the growing demands for water, the City of San Diego created two reservoirs along the river, El Capitan and the San Vicente Dam and Reservoir. One of the most damaging floods washed out many of the human developments and historic landmarks along the river in 1916, including part of the Mission Flume, and was followed eleven years later by another damaging flood in 1927 (Pryde, 1992). The cultural landmarks that remain from this period include the Derby Dike and the town of Julian State Historical Landmarks.



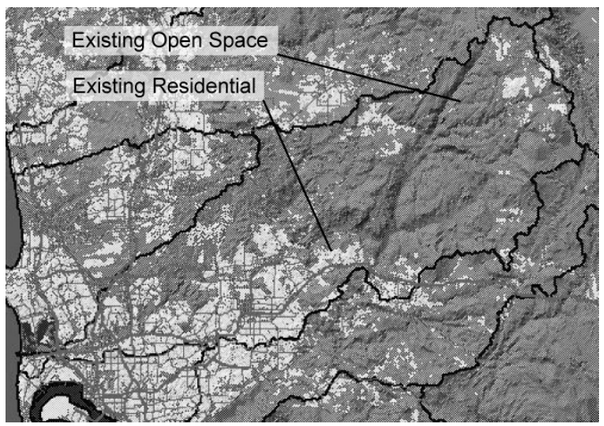
Landscape of the current period

Current Period
(1945 – Today)

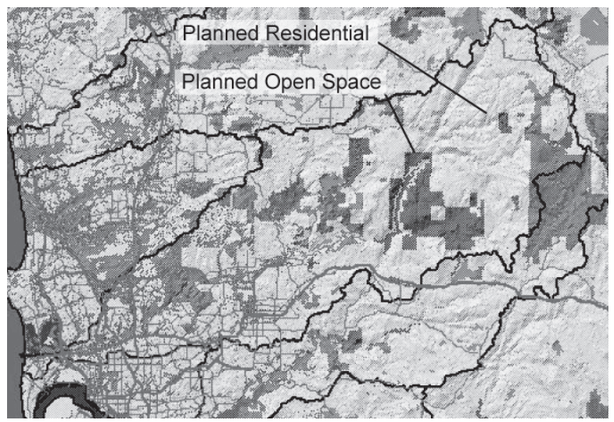
In the 1940s and 1950s the county experienced its second population boom due to the war industry. The county's population grew from 300,000 to over one million. People living within the basin began to move from the flat mesa tops into the valleys (Lynch, 1974). In 1947, water from the Colorado River reached the reservoirs to supply the residents for their consumption. As the value of the land and businesses adjacent to the river increased, the mouth of the river was ultimately channelized between 1950-1953 to further protect against flooding.

In the 1950s, Santee began to urbanize and develop into a suburb of San Diego. Freeways spread across the area and the lower portion of the river transformed into a major corridor with I-8 flanking its south side. Mission Valley, likewise, began to fill in with shopping malls followed by condominiums. Private organizations have financed channelization of segments of the river in Mission Valley and there are ongoing projects in Lakeside to do the same. Land use zoning laws enabled development to occur within the natural flood plain in the more urban areas. Many of the large commercial and residential structures face away from the river, leaving their less attractive operations visible from the river's corridor. Today, the property through which the river flows is in both orivate and public ownership

While the San Diego River hosts national and state historic landmarks, it is losing many of the settlement landscapes that embody the river's heritage. Archeological sites are prey to damage or loss due to lack of public knowledge and development activities. By comprehensively inventorying the historic resources, defining how to preserve or conserve heritage landscapes and developing a management plan for the river park, many of the unique cultural features that have occurred along the river will provide valuable historical resources for future generations.



Existing land use in the San Diego Watershed



Proposed land use for 2020 (SANDAG, 2002)

Growth Projections

The San Diego River watershed's population is continually growing. In 1997, the population was 506,420 averaging 1.82 people per acre. By 2015, the watershed is predicted to have a population of 620,542, with an average of 2.24 people per acre. Because much of the lower watershed has already been developed, there is a projected 23% increase in the density of the population for the San Diego River watershed over 18 years, compared to a 37% increase expected for the entire San Diego region (SANDAG, 1998).

This increasing population growth will continue to impact the San Diego River. In 1995, 115,459 acres of the total 277,543 acres of the San Diego River watershed were developed. According to a 1998 regional watershed study based on forecasted land use, if the currently-approved plans stood, 60,361 of the remaining 162,084 undeveloped acres of the San Diego River watershed could be built-out in the future. The vast majority of this area, 59,096 acres, is slated for residential development (SANDAG, 1998). Private land inholdings in the upper watershed that are currently zoned at forty acres may become open to subdivision in 2010, increasing developmental pressures on the upper watershed (www.co.san_diego.ca.us).

Opportunities

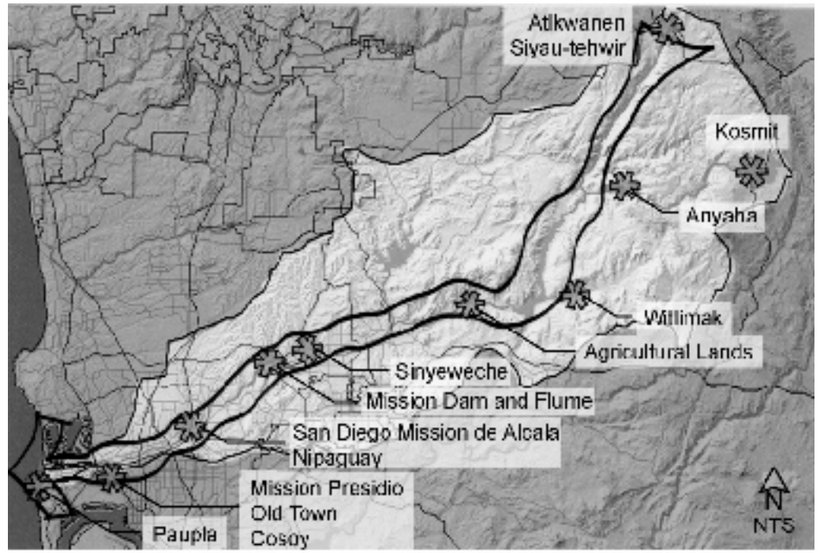
Opportunities provided by the cultural context of the river park include opportunities for developing partnerships with existing facilities and locations, enhancing historic preservation, and facilitating community education.

Develop Partnerships

1. The local Kumeyaay Reservations provide partnership opportunities for promoting the cultural heritage of the early history of the San Diego River.
2. The location of the river in the Cleveland National Forest and Mission Trails Regional Park offers opportunities for partnerships to promote the cultural history of the river within these popular recreation destinations.
3. Existing developed historic sites, including the Mission, Presidio, Mission San Diego de Acala State Historical Landmark, Old Town State Historic Park and Julian State Historic Landmark, provide opportunities for partnerships to increase the recognition of the river as a strong force in San Diego's history.

Enhance Preservation

4. The historic locations of the Atlkwanen, Sinyau-tehwir, Kosmit, Anayha, Witlimak, Senyaweche, Nipaguay, Cosoy, and Paulpa Kumeyaay village sites (White, 2002) can be highlighted to link present day locations with their Native American cultural history.
5. An opportunity exists to preserve the rich agricultural history of the river, threatened by increasing urbanization, particularly in the upper reaches.



Cultural and historic resources along the San Diego River

6. The establishment of the river park offers an opportunity to develop an extensive inventory and management plan for historic sites along the river.
7. Opportunities exist to employ the river park as a catalyst for increased interest in historic preservation and cultural heritage recognition.

Facilitate Education

8. The river's role as a transportation route for the Kumeyaay, stagecoaches, the first transcontinental mail route, and present day freeways can be acknowledged and highlighted.
9. An opportunity exists to highlight the watershed and the river corridor's role in providing much of the building materials for the infrastructure of San Diego County including large amounts of sand and gravel used to make concrete and asphalt.
10. Hydrological engineering projects, including the Mission Dam and Flume, Derby Dike, Mission Bay's transformation from False Bay after the river was rerouted from San Diego Bay and the reservoirs and dams of Cuyamaca, San Vicente and El Capitan, provide opportunities to reveal changes people have made to the river through time and the consequences to the watershed.

River access is dependant on water quality

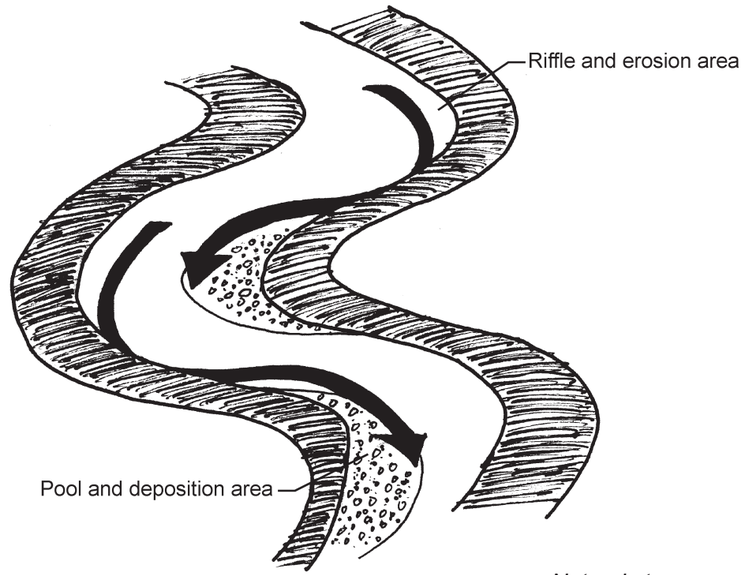
WATER RESOURCES

The hydrology of the San Diego River has changed significantly through time. As the river begins as a trickle in the headwaters and makes its way through the valleys and gorges of the watershed, the river encounters several obstacles that affect its natural processes. The changes are most evident in sediment transport, water volume, and water quality. The change in the ability of the river to transport sediment is seen visibly in river structure and altered habitat. Changes in water volume have affected flood, surface, and groundwater levels. Water quality issues threaten to make the river water unsafe for human activities and wildlife. These three main issues confronting the San Diego River are critical to the environmental health of the region. A river park system would help manage and preserve this vital hydrological resource.

Sediment Transport

Sediment transport is a key component in the natural function of a river. In an undeveloped state, the San Diego River carried nutrients and soil from the Volcan Mountains to the Pacific Ocean. The sediment transport process can be described as taking place in three zones: the zone of erosion, the zone of sediment storage and the zone of deposition. Historically, the zone of erosion for the San Diego River was in the headwaters in the Volcan Mountains. As the water flowed through the mountains, erosion processes carved steep valleys and sediment loads in the river increased. As the river reached the El Monte Valley, historically the zone of sediment storage and transport, the decreasing gradient allowed the water to slow and drop its sediment load. With regular flows and periodic flooding, silts and nutrients were deposited, creating deep, sandy soils and a productive, fertile floodplain. A secondary zone of erosion occurred as the river entered Mission Gorge located in today's Mission Trails Regional Park, In this narrow, constricted geological formation, the erosion increased with the speed of the river. Deep, sandy soils were then deposited again in Mission Valley. During periods of heavy rains, sediment washed rapidly downstream, transporting the sediment all the way to the coast, maintaining southern San Diego's County's sandy beaches.

On a smaller scale, sediment deposition and erosion processes played a major role in creating habitat and maintaining the river's character. The river's structure contained sequences of pool and riffles. Pools occurred on the insides edges of natural stream meanders in the San Diego River, and riffles occurred on the outside edges of stream meanders. Sediment accumulated in the pool areas where water movement was slower, creating new stream banks and habitat, while erosion occurred in the riffles where water movement was faster, carving wider curves in the river and carrying sediment downstream.

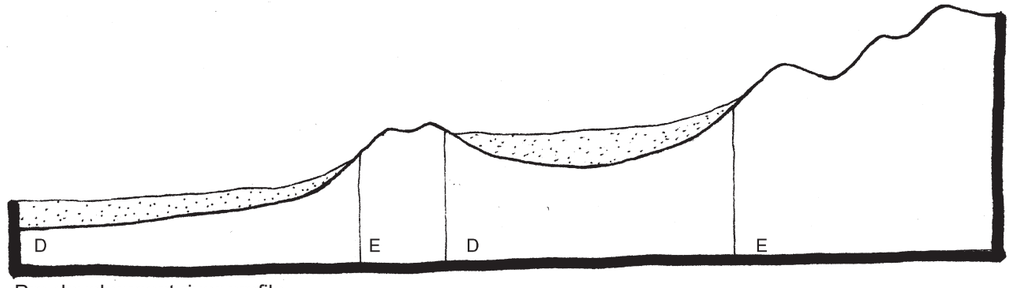


Natural stream processes

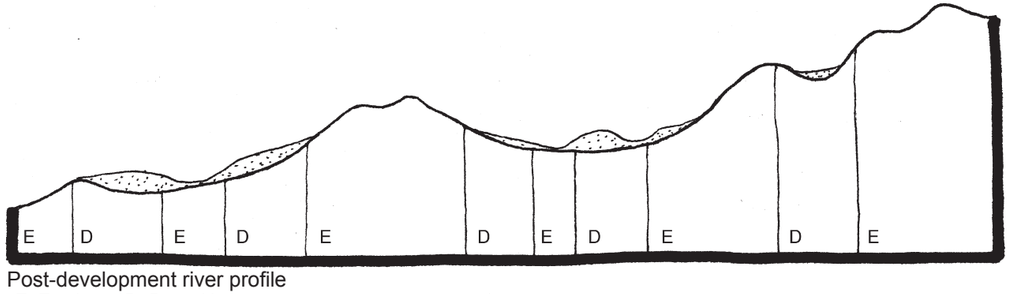
Sediment transport has been greatly altered throughout the watershed by human activities including dam construction and extensive sand and gravel mining. Today, the headwaters is still the area of greatest erosion and sediment production, but the construction of El Capitan, San Vicente, and Cuyumaca Dams has prevented the sediment from reaching the valleys below. When water is slowed at the dams, sediment is dropped, and the water that passes through the dams is clear of sediment. Sediment accumulation behind the dams will eventually result in either decommissioning of the dams or costly sediment removal.

As the river enters its historic zone of sediment storage and transport in the valley, rather than releasing sediment, the clear "hungry" water from the dams picks up sediment through a natural process to maintain its sediment balance (Kondolf, 2002). The erosion and scouring in this area can lead to undermining of roads and structures, and the river no longer replenishes the fertility of the agricultural lands naturally.

Humans have extensively mined the deep soils of Lakeside, Santee and Mission Valley, providing sand and gravel used in the construction of much of San Diego's infrastructure. The San Diego River has been one of the most heavily sand-mined rivers in the nation (Chang, 2002), and the mining pits created in this process act much like the dams but on a smaller scale, slowing the water and causing it to release its sediments. The water



Pre-development river profile



Post-development river profile
E- Erosion D- Deposition

Changes in sediment flow have led to increased erosion in the valleys and loss of sand replenishment at the beaches

that flows from these pits is once again hungry, and scouring and erosion occur to pick up sediment again.

Channelization has occurred in Lakeside to control flooding. The riverbanks are reinforced with four feet of stone buried under four feet of soil and replanted with native vegetation. While this process is helping to restore valuable riparian habitat, the loss of pool and riffle sequences eliminates the natural regeneration of native habitats occuring in natural river environments.

The river remains largely unaltered as it flows through Mission Trails Regional Park, and erosion and natural stream processes continue here today, although the historic Mission Dam near the mouth of the gorge collects sediment before the river enters the gorge. Mission Valley has a single remaining sand mining operation at the mouth of Mission Gorge, scheduled to end mining operations within ten years. The channelization that has occurred in Mission Valley is similar to the channelization in Lakeside, resulting in comparable habitat consequences.

The river is channelized at its estuary adjacent to Mission Bay. The decreased gradient of the river in this flat alluvial plain leads to deposition again, creating a rich estuary environment within the concrete sides. With sediment being accumulated and dropped repeatedly throughout the course of the river, sediment from large storm events is no longer able to reach the ocean in the same quantity as in the past. The loss of this natural source of sand replenishment from the San Diego River and other rivers in the area contributes to costly sand replenishments county wide, which in 2002 cost San Diego County over seventeen million dollars (SANDAG, 2002).

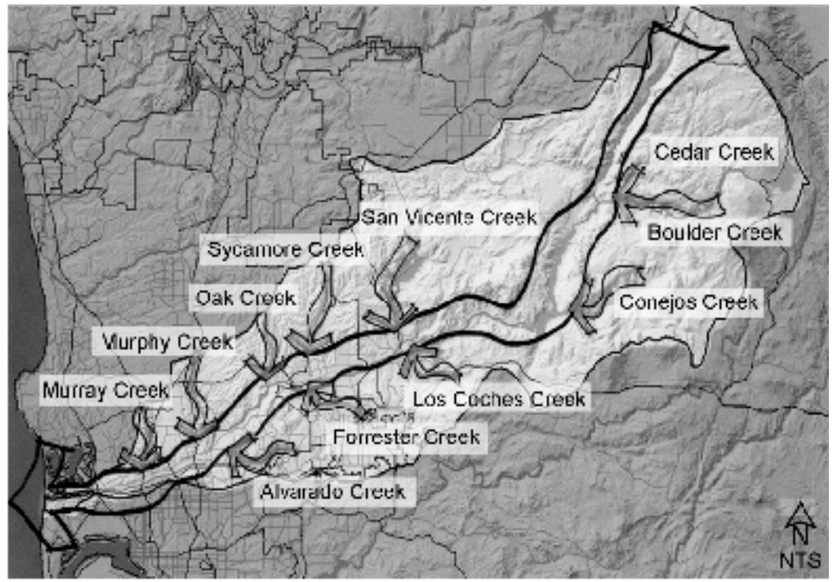
Changes to the natural river character have lead to increased erosion along the river, but only a small amount of this sediment reaches the ocean and replenish the beaches. Most sediments are deposited in freshwater and terrestrial environments at the dams and mining pits, and behind the drop structures that accompany river channelization. This change in the natural sediment balance is costly, as illustrated by the high cost of sand replenishment at the beaches and high potential costs of removing sediment accumulation behind the dams and drop structures.

Water Volume

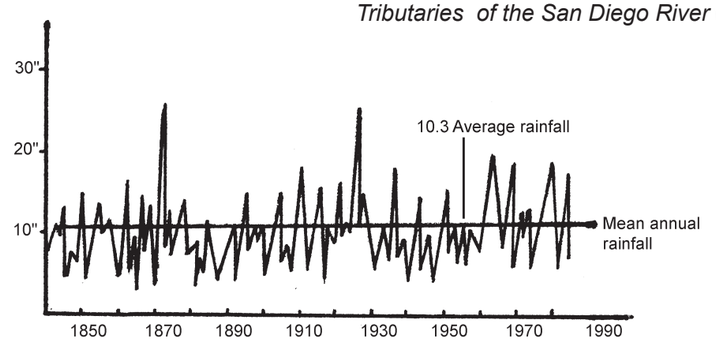
Water volume in the San Diego River has also been altered by human activity over time. Historically, the volume of water in San Diego River varied throughout the year and from year to year. Water flowed freely from throughout the watershed, collecting in tributaries and flowing into the river. In dry years, the river and tibutaries were very low and could disappear completely during summer months. During wet years with heavy snowfall in the headwaters, the river could flow strong year-round. Major flooding occured infrequently in the landscape during high impact storms, making the river so powerful, it could change courses between reaching the ocean at San Diego Bay or present day Mission Bay.

Groundwater in the watershed was amply replenished as most of the precipitation infiltrated into the open landscape. The groundwater collected in two large shallow underground aquifers, the Santee/El Monte basin located in the upper watershed and the Mission Valley basin located in the lower reaches of the river. Springs, including Alvarado Creek in Mission Valley, occurred along tributaries to the river where the aquifer was located close to the surface.

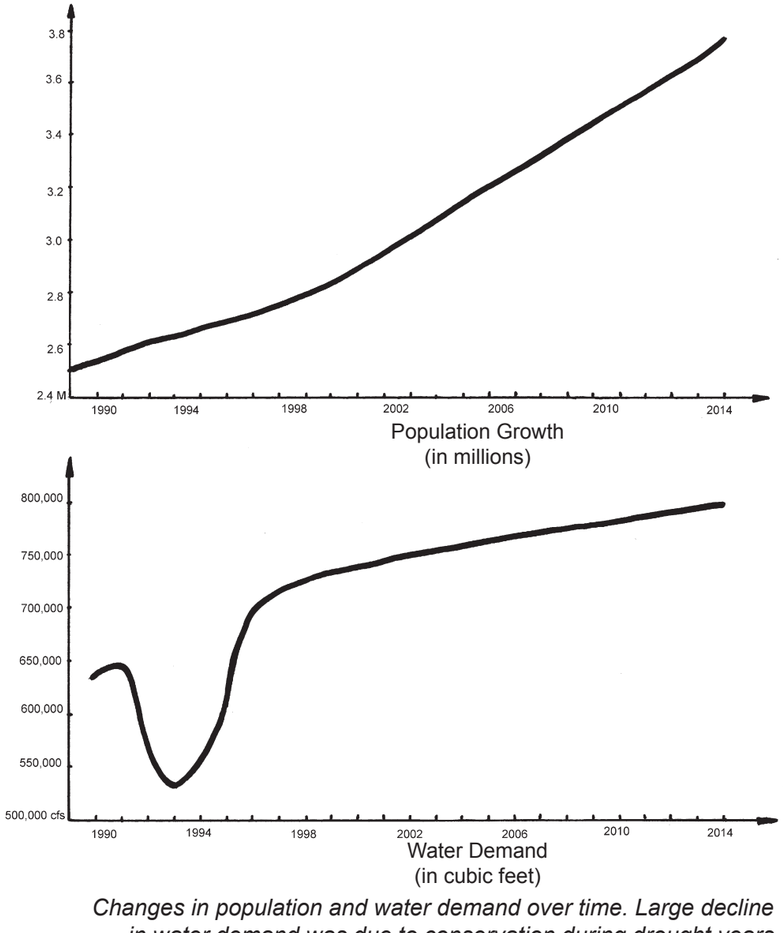
Population growth in the watershed has increased water demands in this arid environment. In efforts to capture the river's water before it flowed to the sea, a number of dams were constructed. The first dam on the San Diego River was completed in 1816, with Native American labor, to hold water for the Mission San Diego de Alcala. Large amounts of sediment built up behind this historic structure, so its water holding capacity today is very small. Cuyamaca Dam, with a holding capacity of 11,600 acre-feet of water, was constructed on the major San Diego River tributary of Boulder Creek in 1887. El Capitan Dam, with a holding capacity of 112,800 acre-feet of water, was completed in 1935. San Vicente Dam, with a holding capacity of 90,230 acre-feet of water, was constructed on the major tributary of San Vicente Creek in 1943 (El Capitan Golf Course Final Environmental Impact Report, 1998). The modern dams were constructed primarily to facilitate increased water supply, but they also serve to control and regulate flooding in moderate storm circumstances and provide recreational opportunities.



Tributaries of the San Diego River watershed



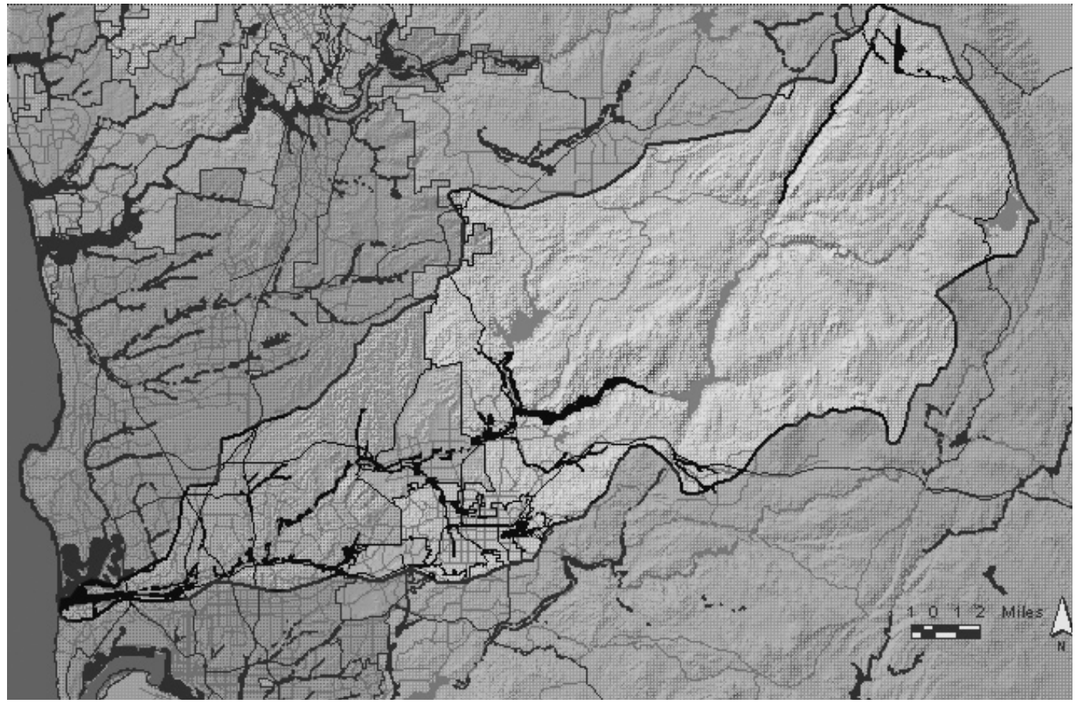
Highly variable average and annual rainfall in the coastal San Diego Area (Cranham, 1999)



Changes in population and water demand over time. Large decline in water demand was due to conservation during drought years

The dams catch much of the water falling in the upper watershed and hold it for local use, yet the quantity of water in the river has increased over time. Imported water contributes to the increased water volume in the river. Despite water collection in dams, the City of San Diego receives only ten to twenty percent of its water supply from local sources in a normal year. The remaining proportion is imported via the Metropolitan Water District of Southern California and the San Diego Water Quality Authority. The imported water, originating as precipitation in locations as far as Utah, Wyoming, Colorado and Northern California, enters the county through aqueducts and is stored in reservoirs for community use (SANNET, 2002). This water enters the river through residential and commercial runoff, from yard and planting irrigation, from treated effluent of a sewage treatment facility in Santee, and during flooding events from reservoir overflow. Imported water is the major cause of year-round flow in the lower reaches today.

As more areas of the watershed are developed, more of the open landscapes that once allowed precipitation to percolate into the ground are replaced by impermeable surfaces such as buildings, roads and parking lots. Water that once would have recharged the aquifers is instead carried through storm drains and sewers into the San Diego River. Due to decreased infiltration, ground water quantities are reduced, and potential sources for future water in the local aquifers are disappearing. Decreasing levels of groundwater also leads to changes to the native habitat which depends on subsurface water to survive, and could result in saltwater intrusion in the lower watershed. At the same time, the natural flooding tendency of the river is increasing, especially in the lower reaches where the cumulative effects of increased runoff throughout the watershed are most strongly felt (Pryde, 1992).

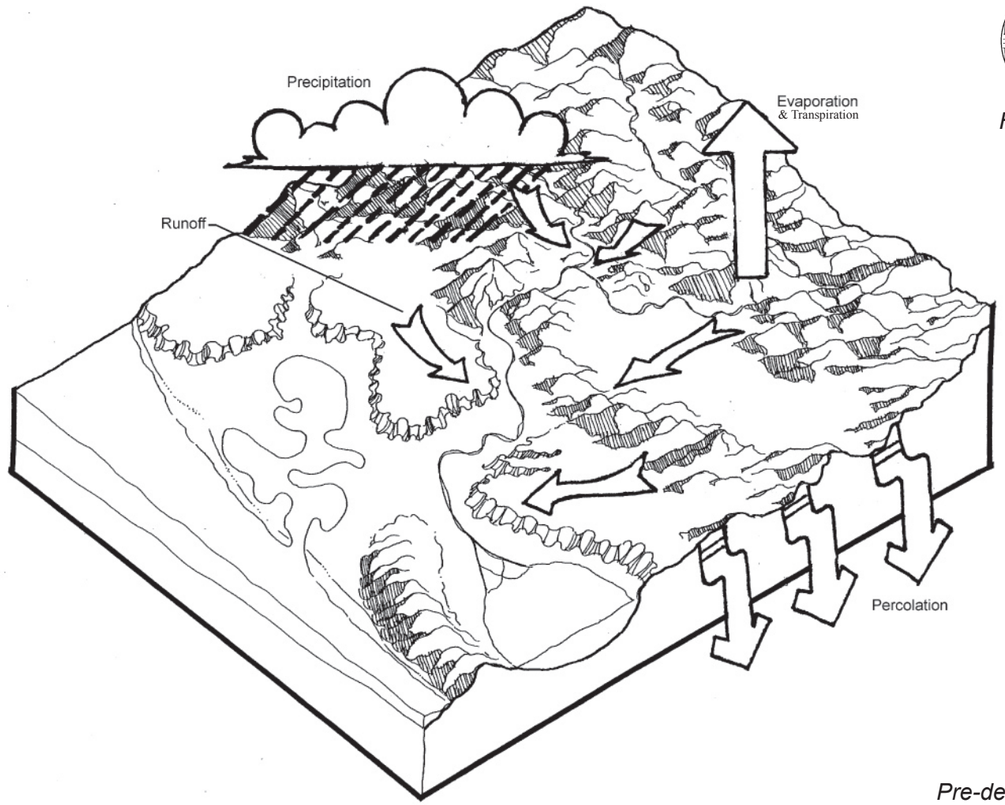


Extents of the San Diego River 100-year floodplain (SANDAG, 2002)

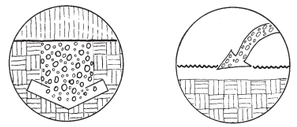
Flooding in the San Diego River occurs with unpredictable frequency and at unpredictable levels due to highly variable rainfall from year to year, making construction within the flood plain of this river especially dangerous (Pryde, 1992). Growth throughout the watershed increases pressure to develop within these volatile areas. River channelization is often seen as a solution to potentially devastating floods, but channelization also offers increased opportunities for development leading to more impermeable surfaces and subsequent increases in stormwater volume. If development continues at this rate, runoff throughout the watershed will continue to increase the amount of water entering the river, and flood risks will continue to rise (www.sdearthtimes.com/et1097sl.html). Nonnative plant species such as giant reed, *Arundo donax*, which accumulates in large mats of debris during flood can potentially increase flood damage (County of San Diego, 2002).

Long-term residents along the San Diego River remember major flooding events. Major flooding in March, 1978 (www.co.san-diego.ca.us) caused extensive damage to infrastructure in Lakeside, washing out bridges connecting the north and south portion of the community. Mission Valley is famous for its frequent flooding, and some structures such as the Fashion Valley Mall Parking Structure have been constructed to withstand major flooding. Channelization that occurred in the 1970s provides increased protection from flooding, but channel capacity may not provide protection from flood events the size of those occurring in 1916 or 1927 (Pryde, 1992). Further development in the floodplain faces an increasing risk of devastating floods.

Surface and subsurface water is closely associated; they are in a continuous process of exchange. Urbanization in the San Diego River watershed has increased water volume in the river, while subsequently decreasing water volume in underground aquifers. Groundwater extraction in the Santee/El Monte aquifer further reduces groundwater quantity in this reach. The natural intermittent character of the river is altered due to the use of imported water, and the potential for devastating flooding is increased.



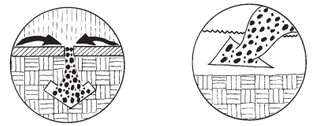
Pre-development hydrologic cycle



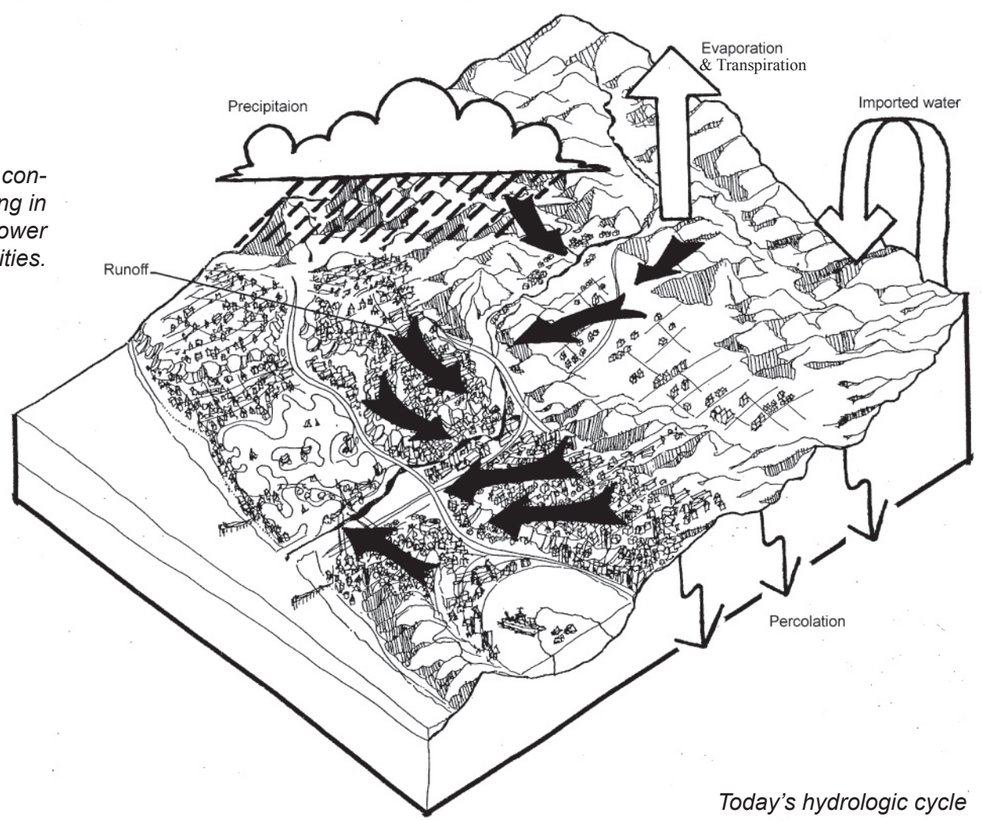
High infiltration rate of clean surface water resulting in clean groundwater

Water Quality

Water quality is the third issue of great concern for the San Diego River. Before the human development of the watershed, all runoff from the headwaters and tributaries not infiltrating the ground was collected in the San Diego River and conveyed to the ocean. The river water was clean except for the soil and sediment it carried with its flow. In the natural exchanging process between surface and groundwater, the aquifers were clean and free of chemical contaminants.



Lower infiltration rates and contaminated surface water resulting in contaminated groundwater in lower quantities.



Today's hydrologic cycle

Today, many factors contribute to the decreased water quality of the San Diego River. Loss of riparian habitat along the river decreases the natural ability of riparian plants to filter contaminants. Agricultural runoff in the upper watershed may contain fertilizers, pesticides and animal wastes that wash into the river or percolate into the groundwater. Recreational fields and golf courses located along the river's banks may also contribute fertilizers and pesticides to the river if not managed properly. Industry located along the river may lead to periodic spills and leakages, with potentially harmful effects to water quality. Known sources of MTBE (methyl tertiary-butyl ether), a carcinogen, groundwater contamination from industrial tank leakage are found in Lakeside and Mission Valley. The Padre Dam Water Recycling Facility which treats sewage in Santee increases phosphorous in the river. Sewage spills and septic tank leakage can seriously impact water quality.

The highest volume of contaminated water entering the river results from urban runoff. With increased urbanization, paved surfaces and automobiles comes decreased stormwater quality. Stormwater and other water that is allowed to flow into storm sewers from yards and planting areas becomes polluted through contact with contaminated surfaces such as roofs, streets, parking lots and driveways. These surfaces contribute oil, paint, lead, and organic compounds to the water of the San Diego River. The first flush, or first five minutes, of a storm event carries the highest concentrations of pollutants, as stored contaminants are washed from these surfaces. Concentrations of contaminants build during dry periods, leading to high levels of water contamination when the rains do fall. Household chemicals, soaps and lawn and garden fertilizers and pesticides are also washed into storm drains which empty into the river. The aquifers are further affected by stormwater runoff that infiltrates the ground.

	Headwaters	Reservoir to 67 Freeway	Lakeside	Santee	Mission Trails Regional Park	Mission Valley	Estuary
Water Sources	Snow, rain	Imported water, groundwater pumping	Imported water, groundwater pumping	Imported water, groundwater pumping	Rain	Imported water, future groundwater pumping	Imported water
Run-off	10%	60%	50%	50%	10%	90%	60-90%
Contamination sources	None	Residential, industrial, agricultural, animal waste	Residential, industrial, golf course, animal waste	Residential, industrial, reclaimed water, animal waste	Carried from upstream	Residential, urban, golf course, industrial, sewage spills	Residential, urban, animal waste
Contamination contents	None	Fertilizers, pesticides	Fertilizers, pesticides, MTBE	Fertilizers, pesticides, phosphorous, fecal coliform, dissolved oxygen, TDS	None	Fertilizers, pesticides, fecal coliform, dissolved oxygen, phosphorus, TDS, MTBE	Fertilizers, pesticides, eutrophic, fecal coliform, lead

Summary of water quality by reach
(Marsh, 1997; Regional Water Quality Control Board, 2002)

The watershed wide problems with water quality are intensified in the lower reaches of the river, as contaminated water from throughout the watershed is concentrated as it flows toward the ocean. These reaches are also the most highly urbanized within the watershed, further impacting water quality. The lower twenty miles of the river are proposed for listing as an impaired water body (Clean Water Act 303(D) listing) due to high concentrations of coliform, phosphorous, dissolved oxygen and total dissolved solids. The estuary at the mouth of the river in Ocean Beach and near-by Famosa Slough are currently listed as impaired water bodies due to high levels of coliform, which means their water quality falls below standards set for designated uses (SWRCB, 2002). High contamination levels have probable but yet undocumented, effects on native plants and animals. Contaminated river water also effects the ocean; beach closings and postings more than doubled in San Diego County between 1996 and 1999, due to urban runoff contamination and sewage spills (County of San Diego, 2002).

The water resource issues of sediment transport, water quantity and water quality in the San Diego River are inseparably linked to one another and to the natural river processes of the watershed. Human development in the watershed has lead to a vast alteration of natural processes of the river. Sediment transport processes changed, leading to changes in erosion patterns, degradation of natural habitat and loss of sand replenishment at local beaches. Water quantities increased in the river, leading to a higher potential for flooding, and water quantities decreased in the aquifers threating of habitat and future human use if current tendencies continue. Water quality has degraded in the watershed, especially in the lower reaches, impacting habitat, and human use.

Opportunities

Based on this understanding of the current water processes in the San Diego River watershed, the following opportunities were identified, focusing on the issues of sediment transport, water quantity and water quality.

Support Sediment Transport Processes

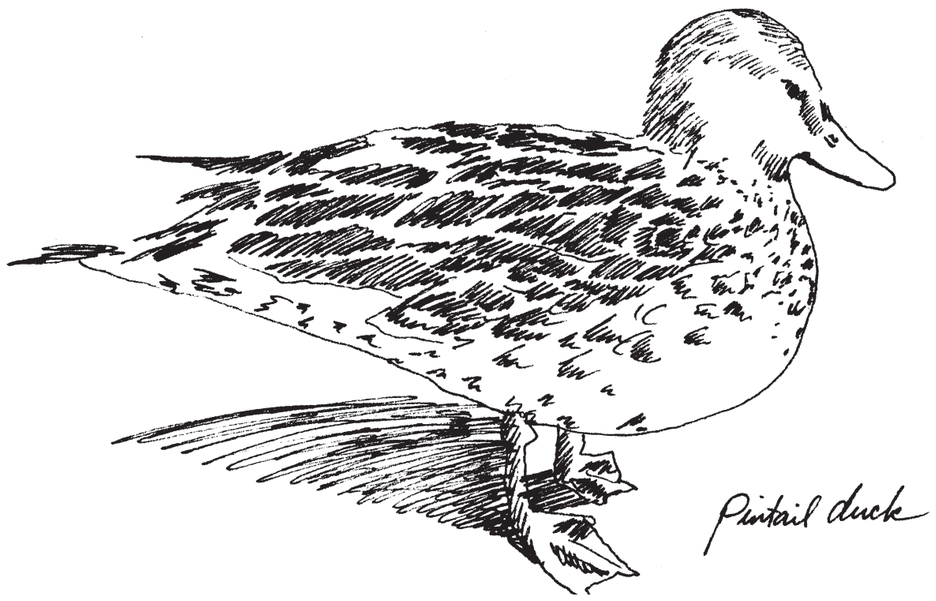
1. Preserve free flowing portions of the river to prevent further deterioration of the natural sediment transport processes that effect erosion balance, habitat quality and sand replenishment at local beaches.
2. Restore the natural grade in mining pits as they are decommissioned to prevent further sediment loss and downstream erosion effecting habitat and beach sand replenishment.

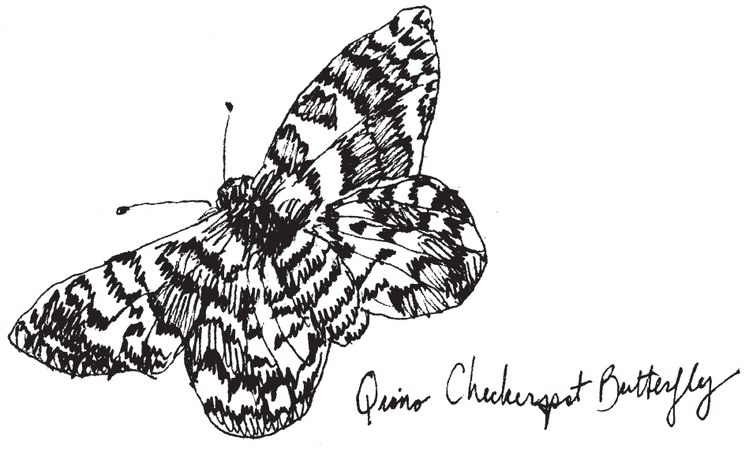
Decrease River Water Volume and Increase Ground Water Volume

3. Maintain and promote the increase of permeable surfaces to decrease runoff into the river and increase groundwater infiltration.
4. Prevent further development in the floodplain in the face of increased flood risk.
5. Remove nonnative plant species in the river that exacerbate flood risks.
6. Facilitate public education about runoff quantity reduction and how to reduce flooding and increase groundwater storage.

Improve Water Quality

7. Maintain native habitat of the river to maintain natural water filtration processes.
8. Promote management strategies for agriculture, recreational fields and golf courses that improve water quality.
9. Use the filtration abilities of vegetation to improve ground water and runoff water quality.
10. Promote public education about runoff contamination and how to improve water quality for the river and groundwater.





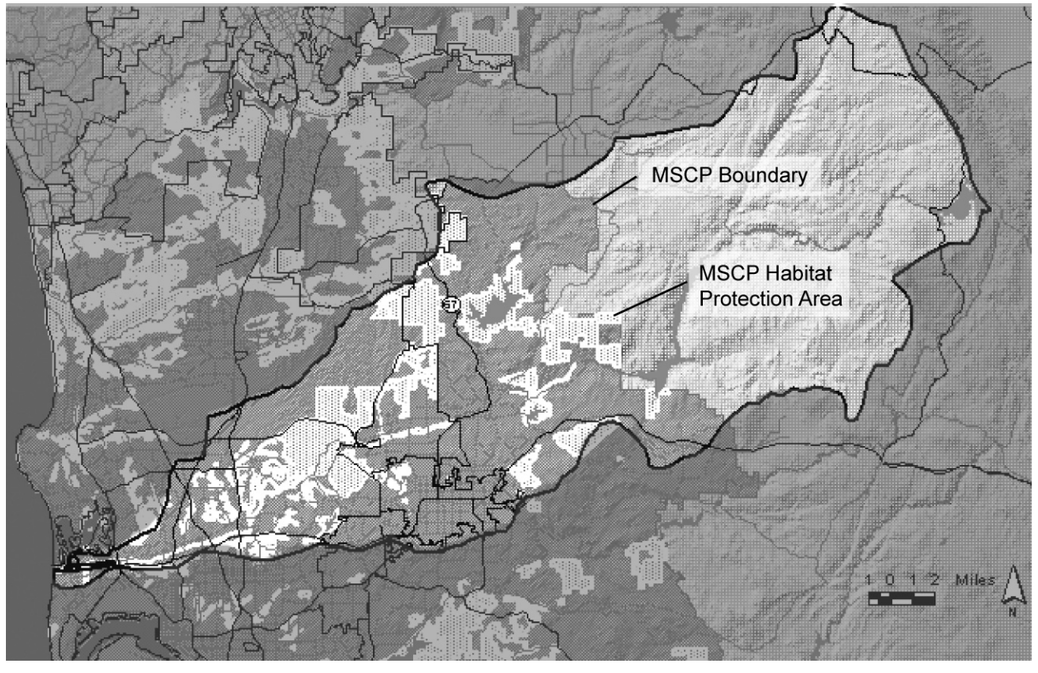
PLANTS AND ANIMALS

The San Diego River, despite the pressures of an expanding population and increasing urbanization, currently provides habitat to a wide variety of wildlife. As the region continues to grow and develop, however, these pressures may overwhelm the river's ability to provide refuge to many sensitive species. The creation of the San Diego River Park offers opportunities to preserve and enhance this highly valuable riparian and upland resource.

Habitat and Disturbances

The San Diego region has been classified as a global conservation hot spot (Conservation International, 2002), and is home to exceptionally high concentrations of endangered species and facing rapid and widespread habitat loss due to increased urbanization. In arid landscapes, such as in San Diego River watershed, stream and river corridors support higher species richness compared to the surrounding landscape (Forman, 1999). Indeed, the San Diego River's habitat provides home and refuge to a wide variety of southern California's highly impacted riparian wildlife, including at least 25 federal and state listed species (please see Appendix E-1for information about the San Diego River's sensitive species). Bobcats, mule deer, coyotes, foxes, small native mammals, native birds, native lizards, reptiles and amphibians, native fish and other aquatic species, native mosquito-eating dragonflies and other insects, and native plant communities all inhabit the San Diego River corridor today.

While much is known about many species in the San Diego River, much still remains to be discovered (Pregill, 2002). The proposed San Diego River Park can provide an outstanding laboratory in which to better understand the ecological functions of a natural system in an urban and suburban environment and the changes occuring there over time. Information about local species populations, interactions and adaption can provide insight into this and other southern California riparian systems. Local high schools, colleges and universities will all have the opportunity to study this unique resource (please see Appendix D-2 for descriptions of the San Diego River's natural communities).

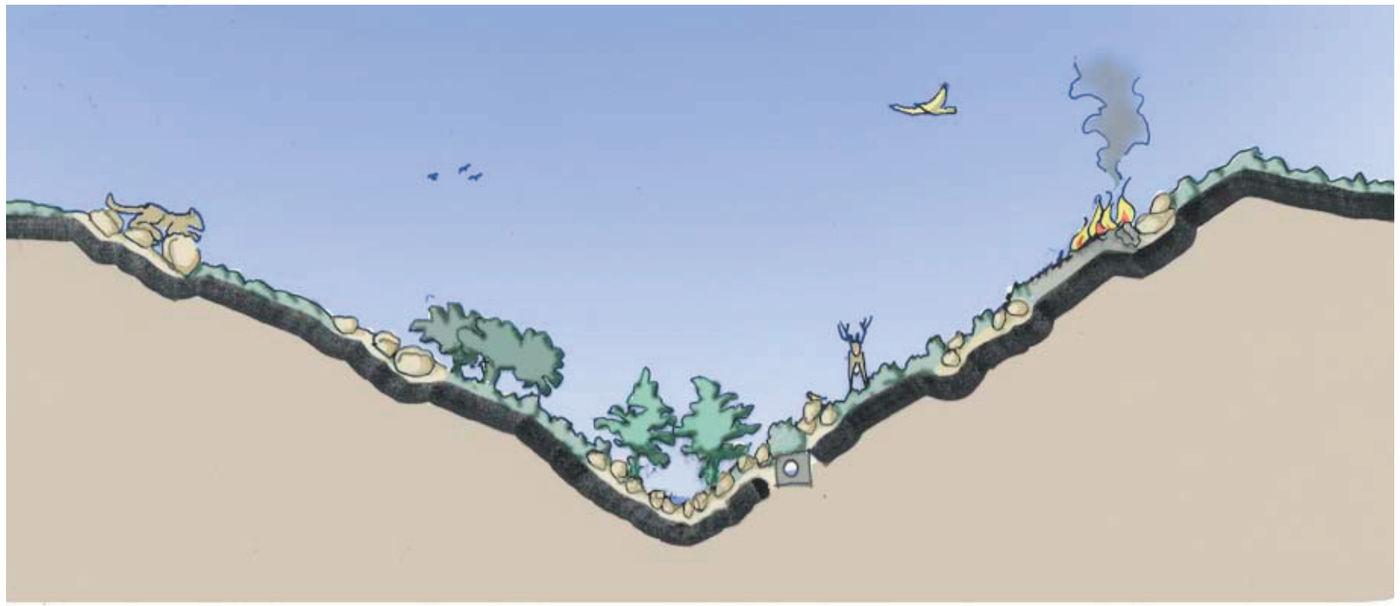


Multiple Species Conservation Plan (2001) boundaries area and protected habitat

A regional effort has recently been put forth to protect sensitive species through the Multiple Species Conservation Plan (MSCP). Adopted in 2001, the MSCP provides regional protection for 86 sensitive species over 582,243 acres. Conservation areas of habitat and linkages are set aside and protected from development to satisfy minimum survival percentages of protected species, while, areas outside conservation areas may be developed as zoned, regardless of presence of sensitive species. MSCP conservation areas offer protection to most of the proposed San Diego River Park habitat. This approach is highly beneficial to the proposed park, but protection from development alone does not guarantee high quality habitat. The proposed San Diego River Park habitat still faces many pressures on habitat quality. Dozens of invasive exotic plant species currently inhabit the river area (please see Appendix D-3 for a summary of invasive exotic plant species in the San Diego River corridor). The presence of these exotic species results in decreased area available for native plant growth as well as decreased habitat value for many native animal and insect species. Some of these plants also impact the hydrology and natural water flow of the river.

Currently, there are many ongoing restoration efforts in areas throughout the proposed river park, conducted by the hard-working people from local parks, preserves, community and nonprofit organizations. These efforts, however, are not coordinated and unified by a single vision or plan. Some particularly invasive species, such as giant reed, *Arundo donax,* and others, are most successfully eliminated only through a unified plan that considers the elimination of local populations as well as source populations. The proposed river park offers the opportunity to better coordinate and plan restoration efforts.

Nonnative plants should be understood at the river-wide scale. Many other pressures on the wildlife habitat of the San Diego River are best understood by examining the unique conditions in each of the river's seven reaches. Habitat characterizations summarized here for each reach are based on SANDAG, San Diego's Regional Planning Agency, data available on line at www.sandag.cog.ca.us, and are based on the Holland 1995 vegetation classification system.

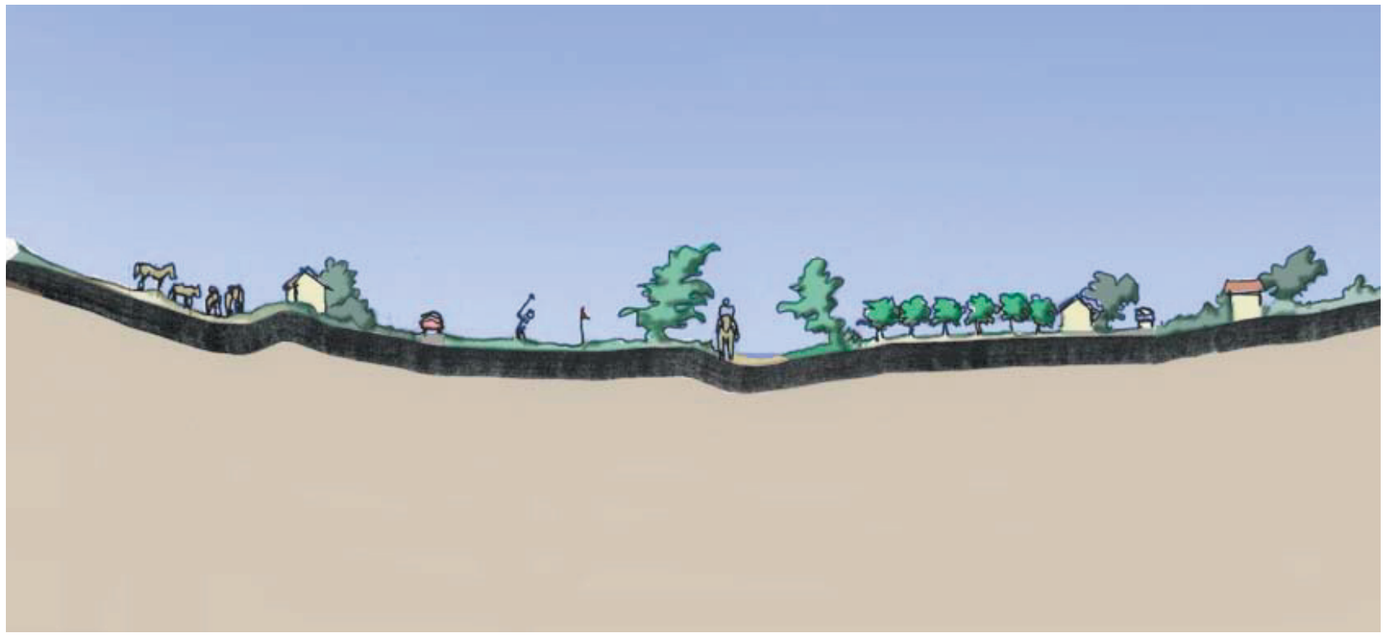


Typical habitat and disturbances in the headwaters such as flooding, fires and culverts

Headwaters

Steep rocky slopes characterize the headwaters. Chaparral communities, including southern maritime, northern mixed and chamise chaparral, dominate these hot, dry slopes. Oak woodland, communities, including dense coast live oak woodland and mixed oak woodland grow in the cooler shaded areas of north facing slopes. Diegan coastal sage scrub occurs nearer the river bottom at lower elevations and in alluvial soils. The river bottom itself is predominantly characterized by southern riparian forest. This habitat is largely protected because of its location within Cleveland National Forest and other public ownership areas, but it is not free from the threats of disturbances.

- Flooding has always been a natural disturbance process here, periodically destroying and renewing the riparian habitat.
- Periodic fires in the chaparral once were also a natural disturbance process, restoring and rejuvenating this fire-dependant habitat. Fire suppression has greatly altered this natural process today. Due to longer periods between fires and fuel load build-up, modern fires have the potential to burn hotter, threatening habitat and species when they occur.
- Culverts and channeling the river under driveways and roads disrupts habitat for some small species.

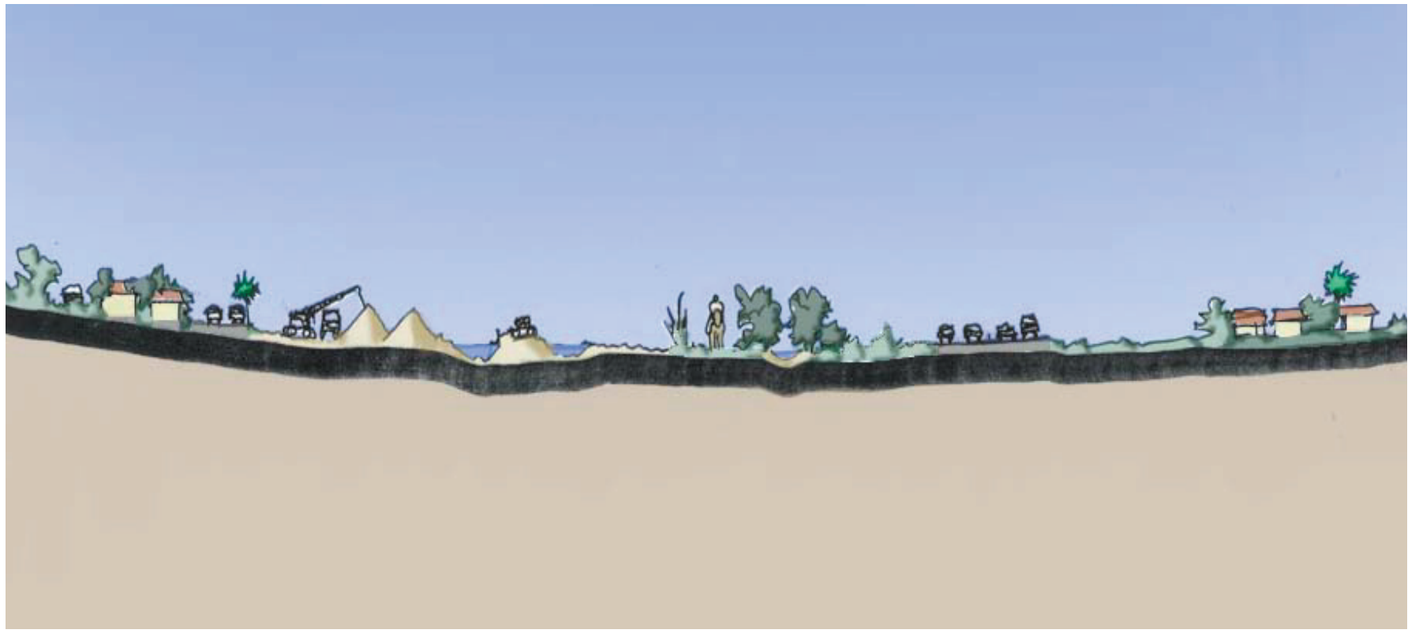


Typical habitat and disturbances from El Capitan Reservoir to the 67 freeway such as agricultural runoff, golf and horses

Reservoir to 67 Freeway

Here, the steep valley sides move out farther from the river, providing rich soils on flat lands dominated by agriculture. Surrounding the river, Diegan coastal sage scrub predominates where agriculture is absent. The river bottom contains the riparian communities of southern riparian scrub with some areas of southern coastal live oak riparian woodland. Disturbances in this reach are primarily caused by agriculture and human recreation.

- Agriculture increases runoff and nutrients in the river, altering its natural habitat character.
- Golf courses can disrupt native upland habitat but preserve riparian habitat adjacent to the river. Nutrient loading from heavy use of fertilizers on turf areas may alter community composition.
- Horseback riding in the river bottom may trample native vegetation and reduces water quality. Horse waste can also attract an introduced bird species, the brown-headed cowbird, Molothrus ater, which parasitize the nests of the federally endangered least Bell's vireo, Vireo belli pusillus.



Typical habitat and disturbances in Lakeside such as sand mining, channelization and freeways

Lakeside

The deep, sandy soils of the San Diego River through Lakeside were significantly mined over the past 50 years. Deep pools resulting from mining operations have lbeen created in the river channel. Southern riparian forest and southern riparian scrub dominate river and pool banks. Spreading urbanization isolates pockets of Diegan coastal sage scrub and chaparral in the surrounding areas.

Mining and urbanization are the major sources of biological disturbances in this reach.

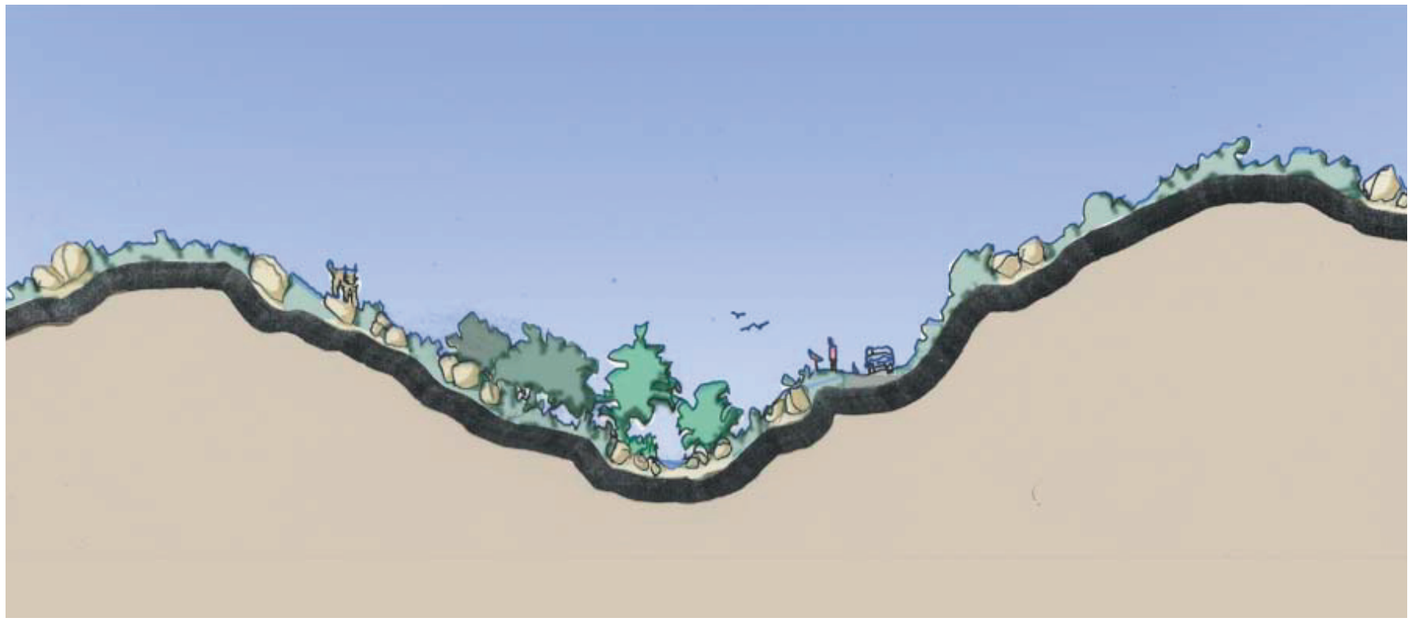
- Sand mining disrupts habitat, but may leave behind ponds which become valuable aquatic habitat.
- Channelization and drop structure construction is replanting native habitat and monitoring for endangered species, but allows for increased development adjacent to the river.
- Freeway and roads crossing the river fragment habitat, making species movement more difficult.

Typical habitat and disturbances in Santee such as suburbanization, recreation and urban development

Santee

The San Diego River through Santee contains a matrix of previously mined and natural areas. Tributaries to the river are both channelized and free flowing. Many riparian areas are within park boundaries, surrounded by suburban development, with small pockets of Diegan coastal sage scrub and chaparral communities remaining. The riparian areas are dominated by southern riparian forest with areas of southern riparian scrub. The aquatic community of coastal valley freshwater marsh is found in some of the previously mined areas. The growth of Santee causes most of the disturbances in this reach.

- Suburbanization introduces pets that may prey on native species.
- Recreation disturbs some sensitive species, but educates the public about the river.
- Urban development changes runoff and water quality, altering the natural habitat.

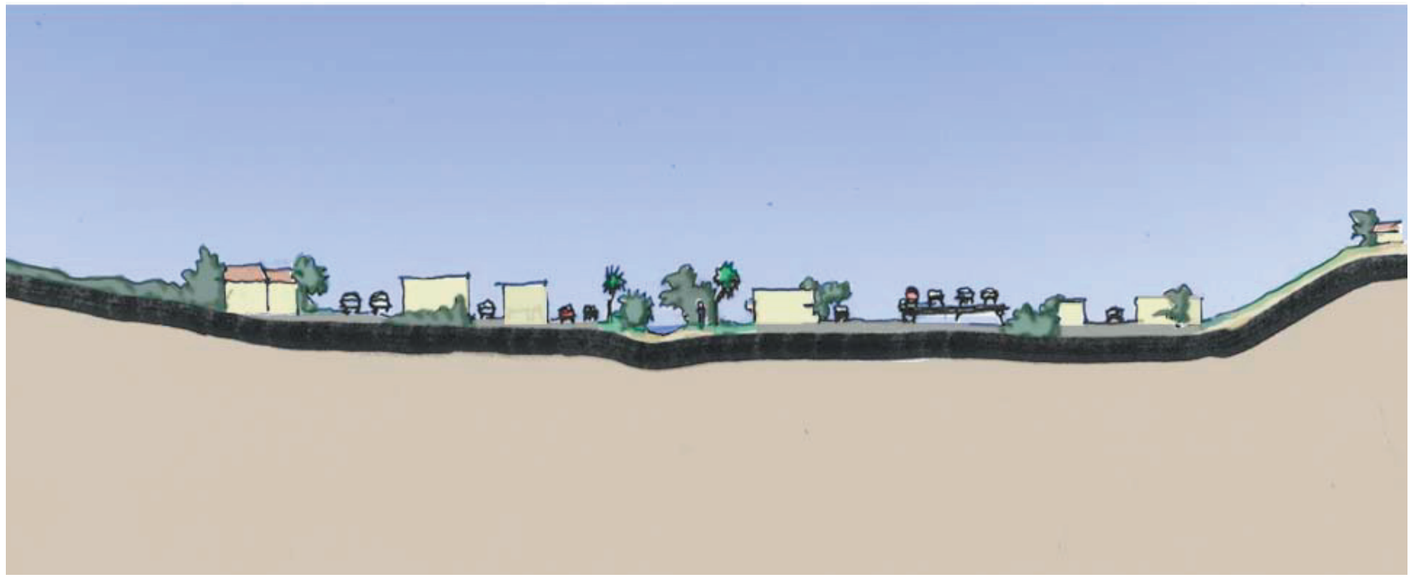


Typical habitat and disturbances in Mission Valley Regional Park such as surrounding roads and potential loss of connectivity

Mission Trails Regional Park

Within this large regional park, steep valley walls enclose the river once again. Diegan coastal sage scrub and chaparral dominate these dry slopes. The river bottom contains a matrix of southern riparian forest, southern riparian scrub and southern coast live oak riparian woodland. Aquatic freshwater habitat occurs in some areas. Threats to this reach primarily stem from the influence of the surrounding reaches.

- Roads and development surrounding the park threaten it with isolation.
- Loss of connectivity to headwaters through Santee, Lakeside and reservoir to 67 Freeway could threaten the long-term survival of bobcat and wildlife populations within the park.

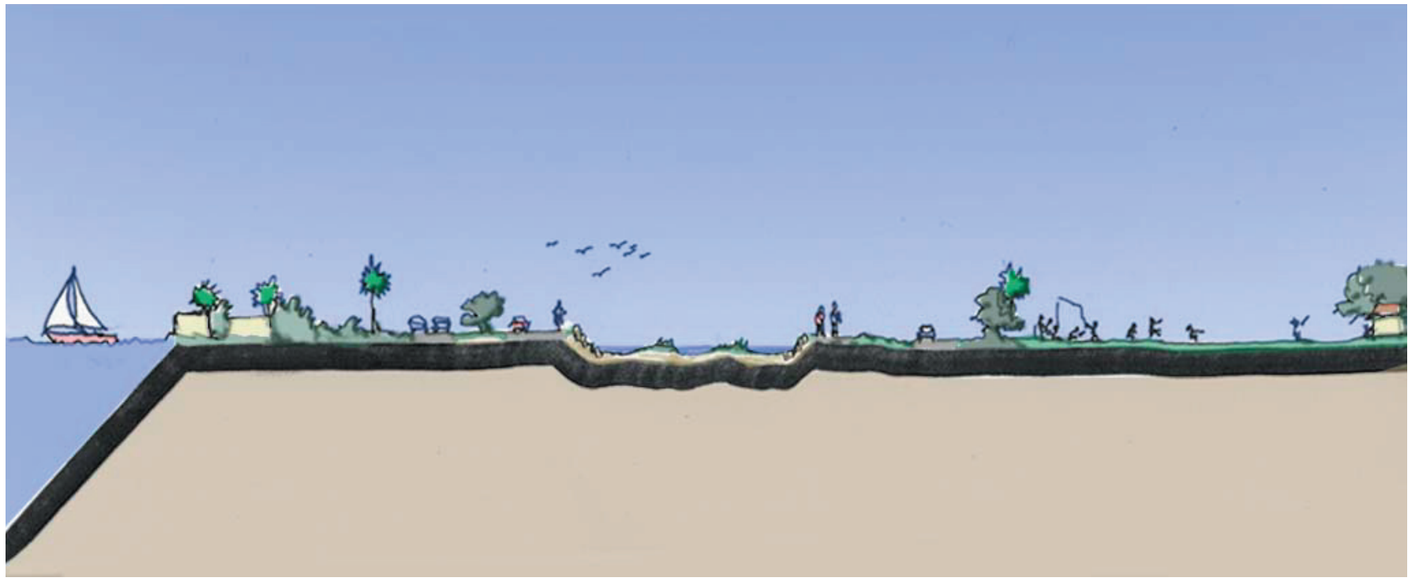


Typical habitat and disturbances in Mission Valley such commercialization, limited native habitat and freeways

Mission Valley

Here, urbanization presses right up to the river's edges, and disturbances begin to seriously affect the quality of the riparian habitat. The narrow river channel habitat communities include southern cottonwood-willow riparian forest, southern riparian scrub and disturbed wetland.

- Commercialization and groundwater contamination have reduced water quality for river dwelling species.
- Development limits the areas available for native habitat and reduces habitat quality, but mitigation projects have recreated pockets of good quality habitat.
- Many freeways and high-speed roads significantly fragment habitat and affect water quality.

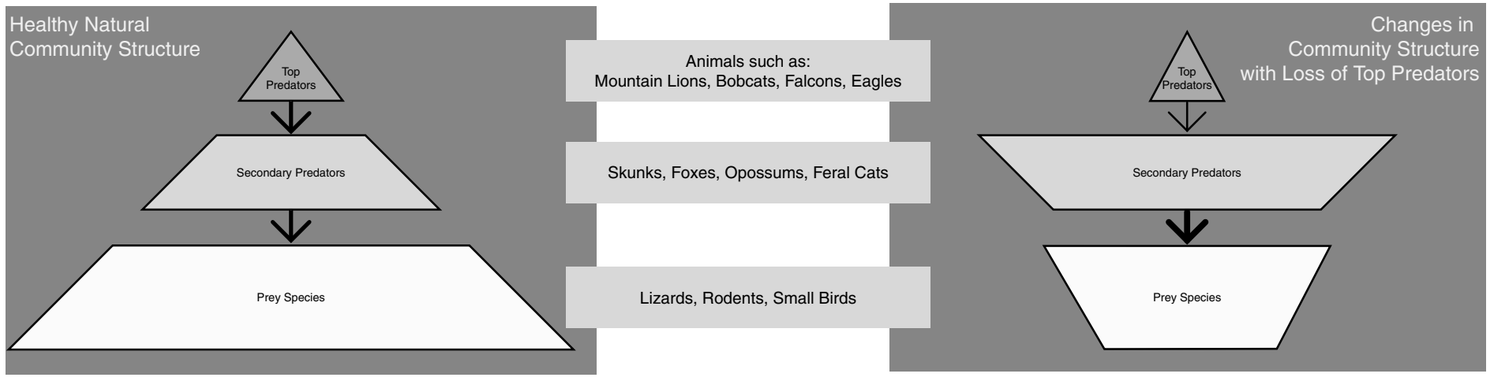


Typical habitat and disturbances in the estuary such as recreation and poor water quality

Estuary

Where the river meets the ocean, it has been soft-bottomed channelized, with an engineered jetty separating its waters from the waters of Mission Bay. Aquatic communities include southern coastal salt marsh, estuarine and intertidal communities provide rich and thriving habitat for a wide variety of bird species, including many rare and threatened species, such as the federally endangered light-footed clapper rail, *Rallus longirostris levipes* and California least tern, *Sterna antillarum brownii*. Threats to this habitat include the cumulative effects of the many disturbances throughout the watershed, and potential conflicts with recreational use.

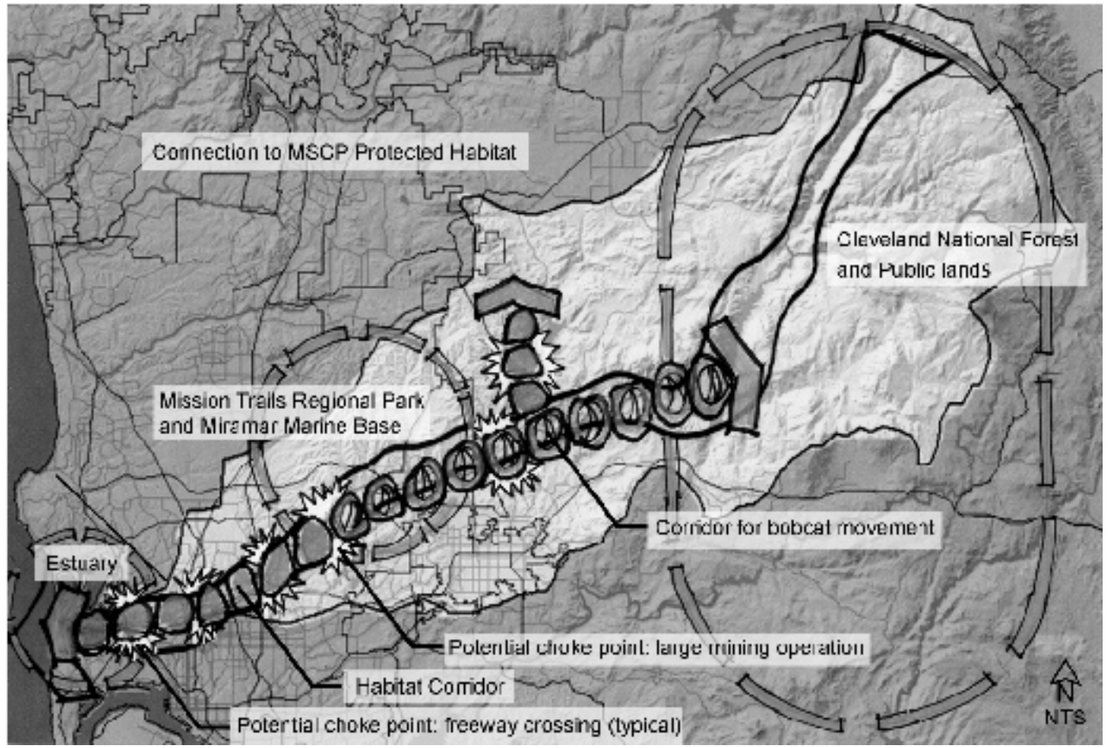
- Recreational activities and off-leash dogs, if not managed properly, can impact birds nesting in the estuary.
- The cumulative effects of water quality issues throughout the watershed are concentrated here, and poor water quality impacts the health of the wetland community.



Connectivity

Along the proposed San Diego River Park corridor, there are three primary large patches of native habitat connected by a linear riparian corridor: Cleveland National Forest and adjacent public lands in the headwaters, Mission Trails Regional Park and the adjacent Miramar Marine Base, and the estuary. Maintaining and improving the viability of the corridor that connects these patches is essential to overall community health. If connectivity is lost and these patches become isolated, the patches lose genetic diversity and native populations decline over time (Beatley, 1994). Habitat corridors suitable for the movement of birds, small mammals, reptiles, insects and plants must be maintained and enhanced along the entire length of the San Diego River Park (please see Appendix H "Designing Riparian Corridors for Biodiveristy"). A connection should also be maintained along San Vicente Creek to connect with preserved habitats and larger habitat patches to the north of the proposed river park.

An issue of particular importance for the proposed San Diego River Park is the potential loss of top predator species. The loss of top predators, such as bobcats, *Lynx rufus*, and mountain lions, *Felis concolor*, who require connectivity for survival, disrupts the balance of the entire community. Top predators have already been significantly reduced within the watershed. Mountain lions once represented the top predator species throughout the region. Spreading urbanization has pushed mountain lions out of all but the very eastern, rural portion of the watershed. Being less sensitive to urbanization, bobcats still range down as far down the river as Mission Trails Regional Park. Farther down the river, in Mission Valley and the estuary, bobcats have been mostly eliminated by intense urbanization and are not likely to return. Bobcats are estimated to occur one per every



Habitat patches, choke points and needed connections

one or two square miles of chaparral (Schoenherr, 1992), and when confined to habitat patches, require connectivity to meet their reproduction and dispersal needs. Without connectivity between isolated habitat patches, bobcat populations will not be able to survive over time, and the communities where they once hunted will be significantly affected.

When top predators, like bobcats and raptors such as falcons and eagles, are lost from a community, the meso-, or secondary, predators grow in number due to decreased competition and decreased predation from the top predators. When native and non-native mesopredators, such as skunks, foxes, opossums and feral cats are allowed to increase in number, they deplete their prey species, such as rodents, lizards and small birds. This, in turn, affects the species they eat, including insects and plants. Maintaining populations of top predators helps ensure better balance throughout the entire community. Raptors such as bald eagles, *Haliaeetus leucocephalus*, and Cooper's hawk, *Accipiter cooperii*, should be encouraged within the proposed park by designing for their specific needs. Maintaining connectivity for bobcats from the protected lands in the headwaters through the reaches of Santee, Lakeside and Reservoir to 67 Freeway is essential to maintain the integrity of Mission Trails Regional Park habitat. A number of obstacles currently exist limiting habitat connectivity of the proposed park including freeway crossings and a large sand mining operation. As native populations continue to feel the pressures of increasing urbanization, these choke points become more critical and options to ensure better connectivity are necessary. Construction that diminishes current connectivity must be avoided.

Opportunities

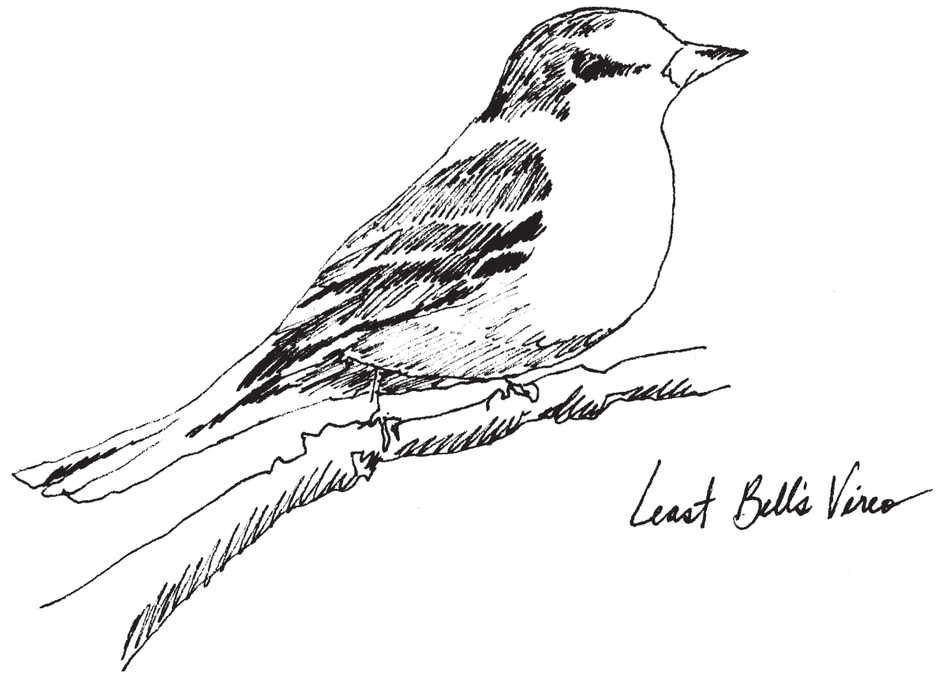
The creation of the San Diego River Park offers many opportunities for the plants and animals of the river by enhancing habitat, maintaining connectivity, integrating recreation and facilitating education.

Enhance Habitat

1. An important opportunity exists today to protect and preserve the remaining habitat of the San Diego River to maintain the diversity of Southern California's highly impacted riparian species, expanding the protection provided by the Multiple Species Conservation Plan.
2. Habitat restoration efforts and exotic invasive species eradication can be increased and better coordinated within the park.
3. The completion of sand mining operations along the river offers opportunities to increase native habitat through restoration.
4. Management practices within the park can help compensate for the loss of periodic natural fires and flooding in the landscape, maintaining healthy plant communities.
5. The river park offers opportunities to improve water quality for the benefit of riparian species.

Maintain Connectivity

6. Urbanization, suburbanization, industry, freeways and roads currently threaten the connectivity of the river corridor habitat. The river park can provide protection of habitat connectivity from the headwaters to the coast by connecting the three large existing habitat patches, maintaining community health throughout the watershed.



7. A bobcat corridor currently exists between the habitat in the headwaters and Mission Trails Regional Park, helping to maintain healthy populations in the park, but rapid growth in the upper watershed threatens this connection. The river park provides an opportunity to maintain this vital connection.

Integrate Recreation

8. Horseback riding can disturb habitat and sensitive species. The park provide opportunities to reduce the impact of horse riding through careful planning of horse trails and facilities.
9. The river park offers the opportunity to better integrate habitat and recreation near the river for the benefit of wildlife, by providing increased protection from disturbances. People can also benefit from enhanced recreational experiences.

Facilitate Education

10. Recreational activities offer opportunities to educate the public about diverse plants and animals of the river environment.
11. Establishment of the river park will provide opportunities to educate the public about the effects of disturbances, such as the impact of domestic pets on the river environment.
12. The river park can provide local schools, colleges and universities with an outdoor laboratory in which to better understand the ecological functions and changes over time in a natural system in an urban and suburban environment.

Hiking to Cedar Creek Falls

RECREATION AND EDUCATION

Areas along the San Diego River are rich with recreational opportunities. There are trails in close proximity to natural areas, urban centers and active recreation fields. Unfortunately, these trails do not link together. The communities along the river corridor have a vision to link these trails to make the recreational component of the San Diego River cohesive and comprehensive.

Recreational Resources

The San Diego River watershed is home to a wide variety of recreational areas, and the San Diego River runs through many of them. Each reach of the river park offers opportunities to expand this network and to integrate all of these into a single comprehensive system.

Headwaters

Cleveland National Forest is a series of wilderness islands that run about 130 miles from South Los Angeles to within five miles of the Mexican border. The southern segment in San Diego County contains much of the San Diego River's upper watershed within its boundaries and offers hiking, biking, backpacking, and camping in 26 developed camp grounds in large, open landscapes and rugged mountains.

Cuyamaca Rancho State Park covers 25,000 acres and includes hundreds of miles of hiking, horse and mountain bike trails. Park campgrounds include family, group, primitive trail and equestrian camping. Cuyamaca Reservoir is located within this park.

A small park located near the first trickles of the San Diego River, Inaja Memorial Picnic Ground and National Recreation Trail, commemorates eleven firefighters who lost their lives fighting the Inaja Forest fires of 1956. A monument is located adjacent to a small picnic area, and a trail provides a 30-minute half-mile loop with spectacular views of the river's headwater and plant identification markers.

Reservoir to 67 Freeway

El Capitan Reservoir, on the river itself, offers seasonal boating and water sport access depending on water levels. There are picnic facilities and fishing along four miles of the shoreline, accessible by foot.

El Monte County Park, located across El Monte Road from the river, is a 98-acre

family oriented park with seven recreation fields and a large picnic area.

Lake Jennings County Park is located east of the river along a tributary, Quail Canyon Creek. The Lake Jennings reservoir serves as the centerpiece of this park, providing water activities, hiking, fishing and overnight camping.

El Monte Golf Course is currently under construction along the river in this reach, and is Audubon Society certified for habitat.

Cactus Park is a community park located along the banks of the river offering a variety of activities including motorcross, baseball, softball, picnicking.

San Vicente Reservoir provides recreational activities in a reservoir on the San Vicente Creek tributary. Fishing, boating and water-skiing are popular activities here.

Lakeside

Willowbrook Golf Course is located on the north side of the river in Lakeside.

Santee

Santee Town Center, a large project currently under construction, will consist of 706 acres of master-planned, mixed-use development with 80 acres of riverside parkland. It includes recreation fields, a skate park, a playground, picnic areas, pools, indoor soccer, a gymnasium and a community center.

Mission Creek Park, located adjacent to a busy WalMart shopping center, provides 40 acres of parkland with trail access along the river. Sand mining reclamation has returned former pits to habitat, and the least Bell's vireo was successfully reintroduced to this area.

Mast Park is a popular 45-acre park with a combination of active uses, trails and natural habitat along the river. Amenities include picnic areas, barbeque grills, horse trails, a playground, a multipurpose court and an exercise course.

Santee Lakes Regional Park and Campgrounds provides recreation and renowned bird watching along a series of seven scenic lakes that help clean and filter reclaimed water. This 190 acre park located along the Sycamore Creek tributary, offers camping, fishing, playgrounds and picnic areas.

Adjacent to the Carleton Oaks Golf Course and Country Club there are plans to reestablish wetland habitat in disturbed areas, and to create an easement for public access trails to connect with other river side parks in Santee.

Mission Trails Regional Park

This large regional park provides nearly 5,800 acres of both natural and developed recreational areas and is one of the largest urban parks in the country. The park contains over 40 miles of trails, including interpretive trails, a state of the art visitors' center with a large deck and amphitheater, as well as boating on Lake Murray. The park is home to the historic Old Mission Dam built to provide water for the Mission San Diego de Alcala.

Mission Valley

Admiral Baker Golf Course is located on United States Navy land in Mission Valley, and provides golf facilities and recreational for military personnel and their families.

The area known as "FSDRIP", the First San Diego River Improvement Project, is a flood management project along the river in Mission Valley. Although not a park, public access, parking, picnicking and a series of trails provide access to the river.

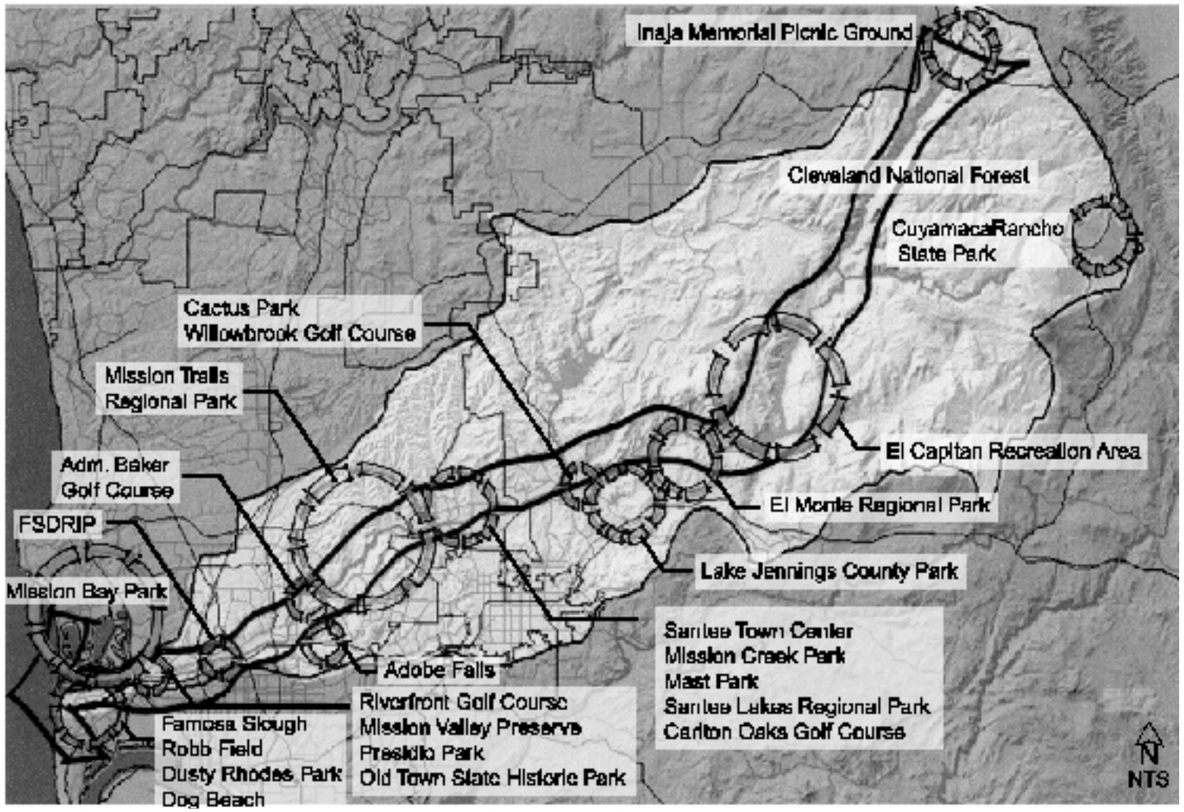
Adobe Falls, a spring fed waterfall on the Alvarado Creek tributary to the river is proposed to be improved as a natural park in the urban landscape of Mission Valley. Currently, trails offer access to the falls.

Located near Old Town, Presidio Park commemorates the site where Father Junipero Serra established the first mission in California. Pedestrian trails lead to a 1929 mission style museum with striking views of Old Town, the San Diego River, Mission Valley and the Pacific Ocean.

Old Town San Diego State Historic Park recreates life in the Mexican and early American periods in San Diego. Five original adobe structures and other historic buildings are part of the complex which includes restaurants, shops and a museum. Old Town was originally built near the banks of the San Diego River, but this connection was lost when the river was permanently redirected into what is now called Mission Bay.

Riverfront Golf Course, located in the heart of Mission Valley, has an approved plan to convert the area to river access with mixed use development.

The Mission Valley Preserve extends through the valley to the estuary and is a natural area with trails and active native plant resoration work. The Preserve provides the opportunity to link historic Presidio Park and Old Town with the Estuary and Mission Bay Park. Adjacent to the Preserve is the Septon Field little league area.



Parks and golf courses along the San Diego River

Estuary

Famosa Slough is a thirty acre urban wetland originally part of the Mission Bay wetland complex. The slough was gradually isolated by the Ocean Beach trolley tracks, a landfill, channelization of the San Diego River, and freeway and road construction. The slough is naturally flushed with salt water from the river channel, and collects rainwater and runoff from its 300-acre watershed. Recreational opportunities at the slough include walking trails and bird watching.

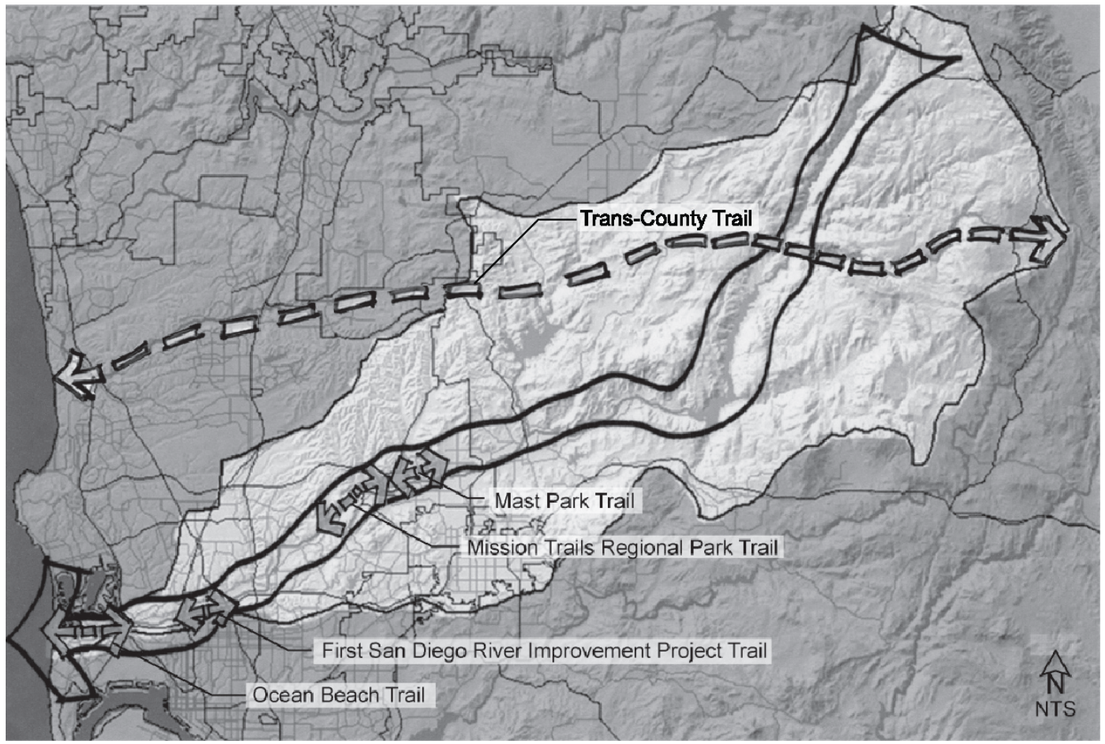
Mission Bay Park is a popular recreational area. Activities include water sports, picnicing and wildlife viewing in the Southern Wildlife Preserve

.

Robb Field Recreation Center is a heavily used active sports park located along the channelized bank of the river in the estuary. Facilities at this park include recreation fields, picnic areas, weightlifting, a community center and a skateboard park. A multi-use pedestrian and bicycle trail follows the river through the park.

Dusty Rhodes Park, located across Sunset Cliffs Boulevard from Robb Field Recreation Center provides a large open space used for sports, dog excercize and other activities.

Dog Beach, the final park area along this system of recreational areas which began in the headwaters, provides a beach where dogs can be off-leash to enjoy the waters of the San Diego River and the Pacific Ocean. Trails meander through sandy habitat areas adjacent to the estuary.



Existing trails along the San Diego River

Trails

In addition to trails provided within the parks and recreational facilities along the river, a number of other trails follow the San Diego River or offer opportunities for connection to the river.

The Trans-County Trail, running north of the western portion of the San Diego River before crossing the river near El Capitan Reservoir, provides a connection from San Diego's coast to the mountains, and provides a valuable regional link to the river park.

The Cleveland National Forest and Rancho Cuyamaca State Park provide many regional trail opportunities in the headwaters, but the terrain is very steep along the river itself, so only limited access is provided.

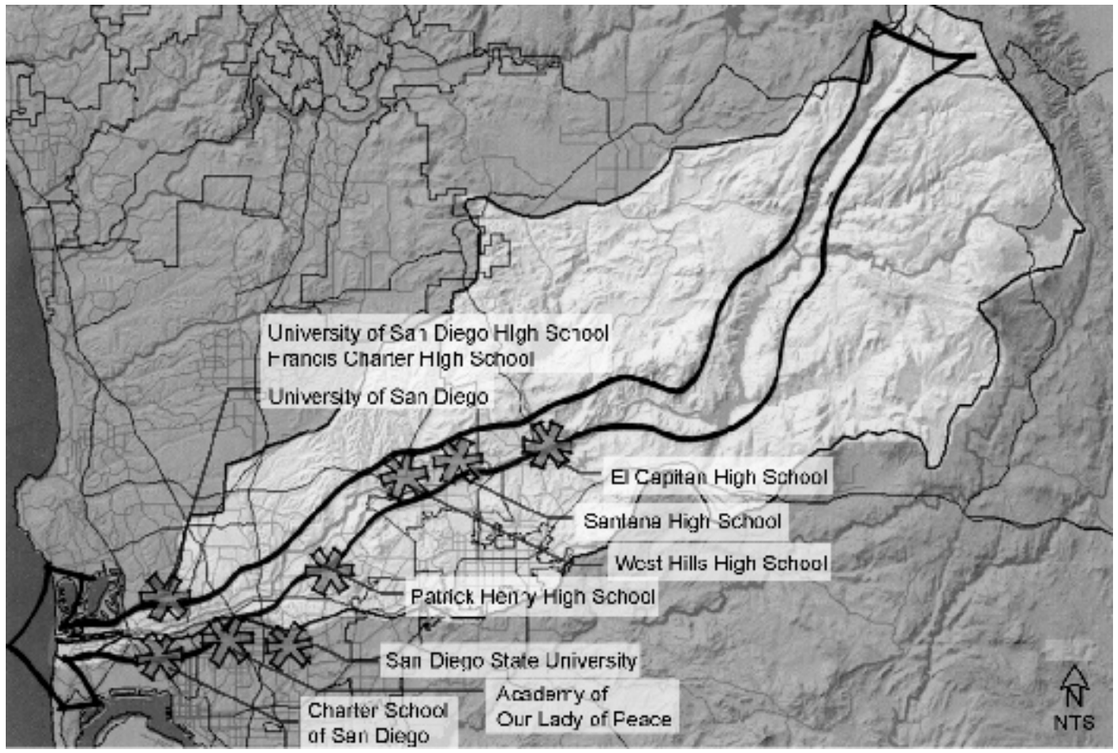
Reservoir to 67 Freeway segment does not currently have any official trails along the San Diego River.

Lakeside is working to establish trails along the San Diego River Improvement Project running through the community.

Liability, easement issues and habitat conflicts need to be resolved to implement these trails.

The city of Santee provides trails through all of its river-adjacent parks, and a complete trail connection through the city along the river will be completed when their San Diego River Park Plan implementation is completed in 2010.

Mission Trails Regional Park (MTRP) offers a trail near the river through the entire length of the park.



High schools and universities in the project area

Through Mission Valley, trails are provided along parts of the river, but not all. Existing paved portions include a three-mile segment from Dog Beach west to Pacific Highway, a half-mile portion from Fashion Valley to Avenida Del Rio, trails through FISDRIP and a bike path through the Qualcomm parking lot. Mission Valley Preserve has a relatively short unpaved trail; as well. Plans are pending for additional segments.

Educational Resources

There are several sites along the river that serve an educational purpose. First and foremost, are the many schools in close proximity to the San Diego River. Lakeside and Santee both have high schools with active science departments for which a river park will be an invaluable resource (Purdy, 2002). Further down the valley the river flows below San Diego State University and the University of San Diego. Both schools already rely heavily on the river as a research area, but would benefit greatly from further research in a protected river park. In turn, this research can enhance and improve the river park into the future. Mission Trails Regional Park and Old Town State Historic Park provide interpretive information on historic uses of the river corridor linking visitors with the past. Mission Trails Regional Park provides excellent facilities for learning about the natural history of the area, and there a few interpretive signs in the estuary that signify a great first step in incorporating more outdoor education elements into the river park.

Opportunities

The San Diego River Park provides great opportunities to connect and expand upon the existing recreational systems within the region. Opportunities also exist to enhance the educational experiences at local schools, colleges and universities. Existing interpretive elements along the river can be expanded upon.

Connect Existing Facilities

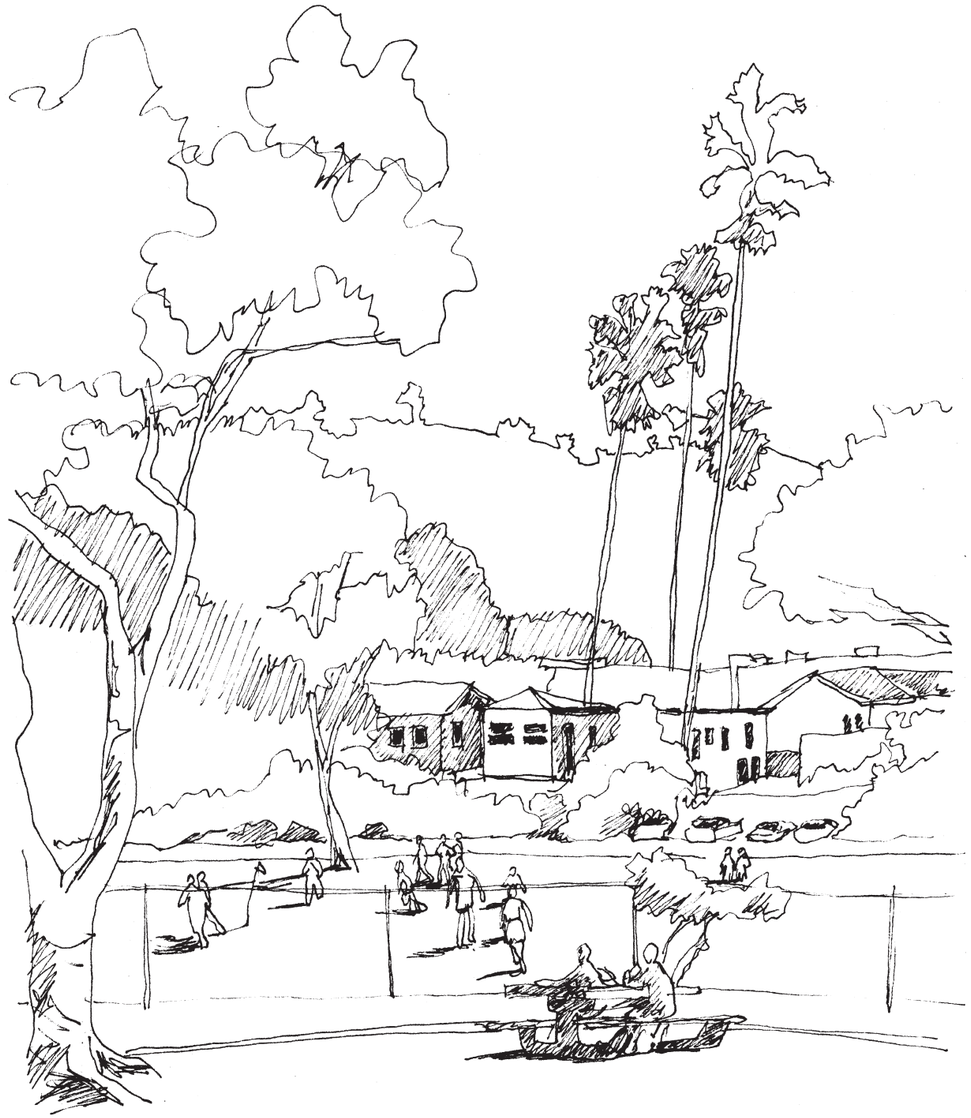
1. Currently, many recreational opportunities exist along parts of the river. Opportunities exist to unify and connect these facilities through the river park.
2. Existing trails near the river are fragmented and disconnected; the river park provides opportunities for a connected trail system used for recreational.

Provide Additional Facilities

3. As the watershed's population continues to grow, so will demand for recreational opportunities. The river park provides an opportunity to meet these future recreational needs.
4. There are many opportunities to expand the existing trail system. Secondary trails can provide river park users with a wider variety of experiences.

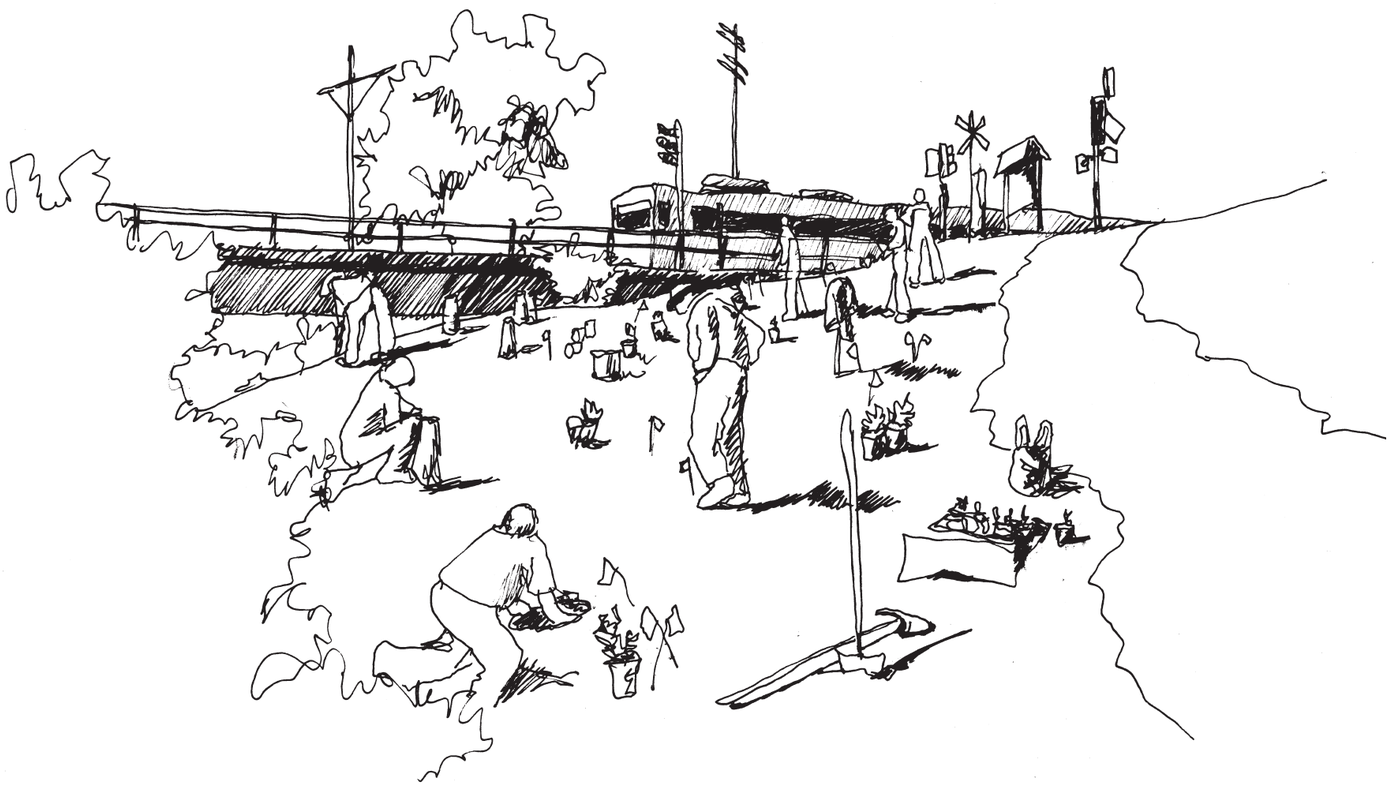
Enhance Educational Opportunities

5. Schools, Colleges and Universities: Many schools, colleges and universities utilize the educational opportunities provided by the river. Opportunities exist to expand this network, benefiting students and the park through future research.



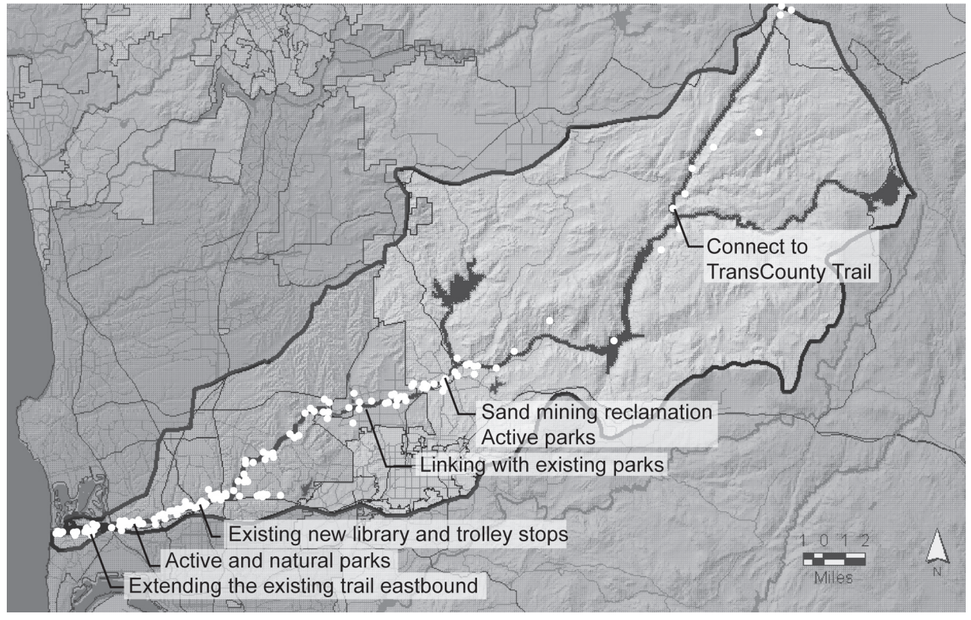
Soccer at Robb Field

6. Interpretive Resources: There are few interpretive resources available along the river today. The river park can provide the opportunity to greatly expand the public's understanding about the San Diego River.



Community Involvement

Community meeting in Lakeside



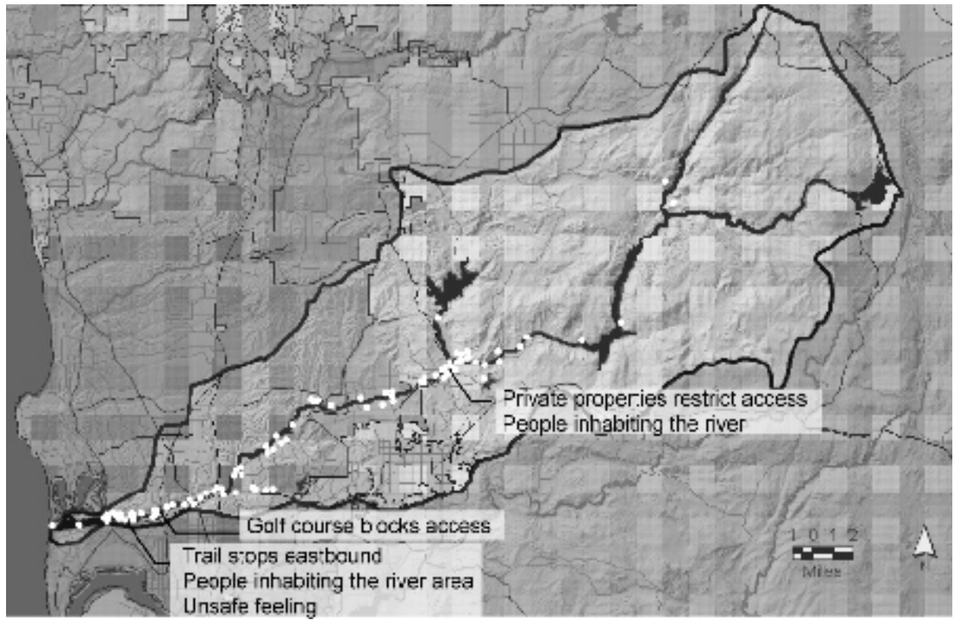
Opportunities for the river park gathered from community meetings

WORKSHOPS

In order to create a comprehensive plan reflecting of the community's desires and needs for the San Diego River Park, workshops were held to gather information. Over one hundred people participated in these meetings in February, 2002, expressing their vision for the river park. The first workshop was held on February 15th with the San Diego River Coalition at Tecolote Nature Center. The second and third workshops, publicly advertised and open to all interested community members, were held in San Diego and Lakeside on February 21st and 28th, respectively. The meetings began with a vision gathering exercise where everyone participated as a whole and then attendees broke into smaller groups for mapping exercises to highlight the opportunities and constraints for a river park. A survey was handed out to offer a forum for private responses and a map of favorite places along the river was plotted.

The visioning exercise asked the attendees to voice what they would like to see for their river park. Visions were stated by participants and written on large paper for the group to view. Patterns in responses were then assessed by allowing each community member to vote, by placing a sticker by their choices, for their two favorite visions. Of the visions that were most popular, enhancing recreational opportunities, improving water quality, preserving natural habitat and access to educational opportunities were a common thread. (Please refer to Appendix E-1 for a complete list of visions).

The mapping exercises looked at the river in terms of the seven reaches. The participants were asked to choose a group based on the reach in which they were most familiar or interested. Group members were asked to map and describe what they saw as opportunities and constraints for the proposed San Diego River Park. When opportunities were mapped, the responses were rich and covered the entire project area with possibilities. The highlights from east to west, included connecting with the Trans-County Trail above the reservoir, sand mine reclama-



Constraints for the river park expressed at community meetings

Community meeting in San Diego

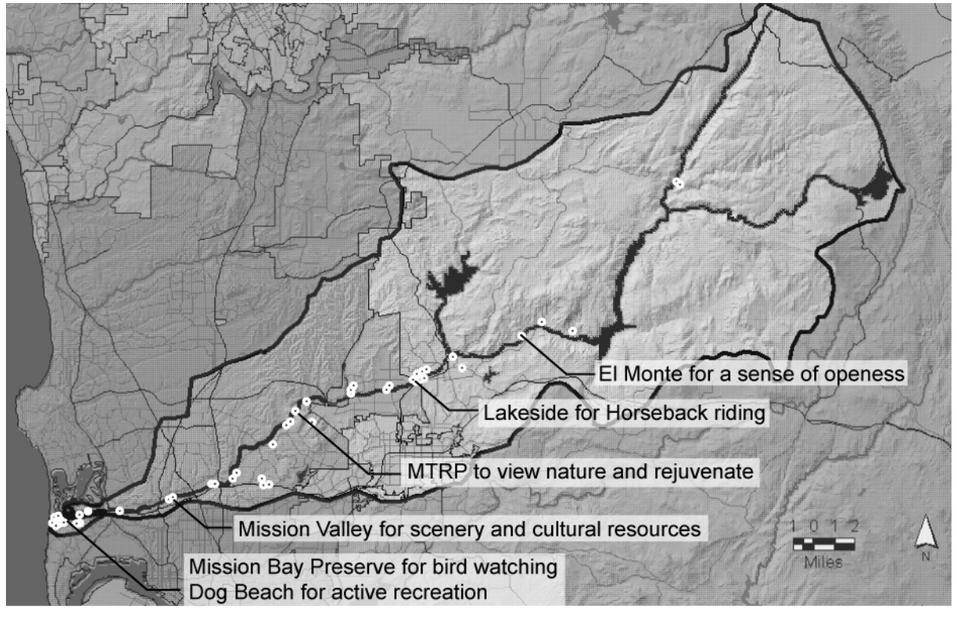
tion, active parks, the new library in Mission Valley, trolley stops, active and natural parks, and extending existing trails eastbound from Mission Bay.

In mapping the constraints, with the same groups on the same base map, a majority of areas highlighted were in the Mission Valley area and the community of Lakeside. Some of the constraints listed focused on trail disconnection and the unsafe feeling created by people inhabiting the river floodplain. Another constraint was private property, including golf courses, which could disrupt a continual trail system. Often it seemed that the areas highlighted presented opportunities in their constraints. Where sand mines existed as constraints, opportunities were seen for reclamation in the future. Where trails were disconnected, opportunity was seen in future connections (Please see Appendix E-2 for a detailed summery of opportunities and constraints).

The survey consisted of three questions and provided a forum for the participants to record their thoughts privately. The first survey question asked whether or not the respondent currently visited the river, and if not, why. Most did not respond, as they were regular visitors, but those who did cited lack of legal access and safety concerns as the main reasons for not visiting. The next question asked if they did visit the river, where they went and for what reason. The most common reason was for hiking, birding, and horseback riding. In accordance, the highest responses to the survey question asking what changes would increase their visits to the river, were continuous trails and access. The final survey question asked how the respondent would like to see the river for their children or grandchildren. Interestingly enough, it coincided nicely with the vision statements that were given at the beginning of the meetings. The top answer was natural habitat rich with bird-life. Next on the list were trails, recreation water activities, and better water quality.

A separate map charted community

Mapping exercises were done to gathering the communty's input



Summary of "Favorite Places" expressed at the community meetings

members' favorite places along the river. Workshop participants were invited to visit this mapping station at some point during the evening to mark and describe their choice. Favorite places were well dispersed along the entire length of the river. The most concentrated responses were Dog Beach for active recreation, Mission Bay Park for bird watching, Mission Valley for scenery and cultural resources, Mission Trails Regional Park for nature viewing and rejuvenation, Lakeside for horseback riding, and El Monte, in the Reservoir to 67 Freeway reach, for its openness.

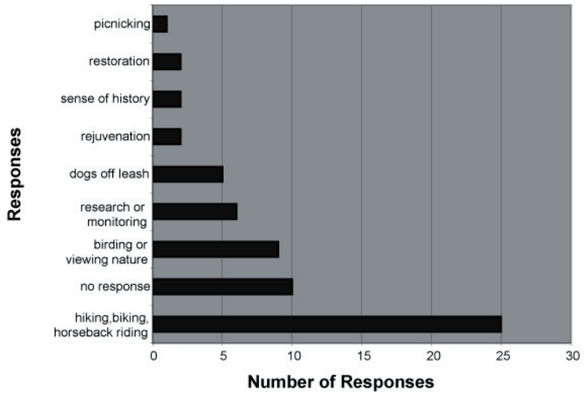
The community workshops were invaluable in providing information about how the community sees the future of the San Diego River Park, and this information was used to help generate the planning goals and objectives driving the design portion of this project.

OTHER INVOLVEMENT

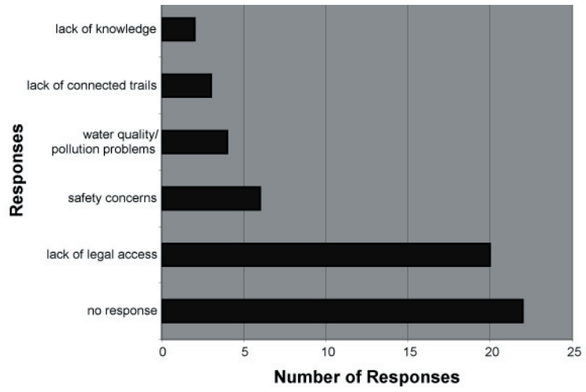
In addition to the community workshops, there were a series of presentations to local groups who are focusing on San Diego River issues. There was also tremendous input, support and professional advice from many local experts who donated their time and knowledge on detailed scientific, planning and design related issues.

Presentations:

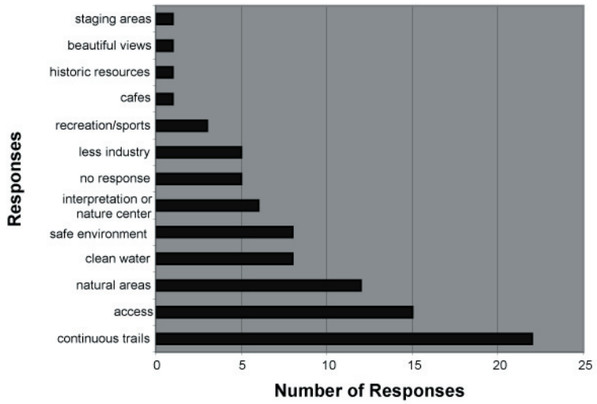
- January19, 2002 San Diego River Coalition
- January 25, 2002 Select Committee on Park and River Restoration, Hosted by California State Assembymember Christine Kehoe
- April 5, 2002 Select Committee on Park and River Restoration, Hosted by Assemblymember Christine Kehoe
- April 19, 2002 San Diego River Watershed Workgroup, Hosted by Teresa Brownyard
- May 3, 2002 San Diego River Park Coalition, Hosted by San Diego Mayor Dick Murphy



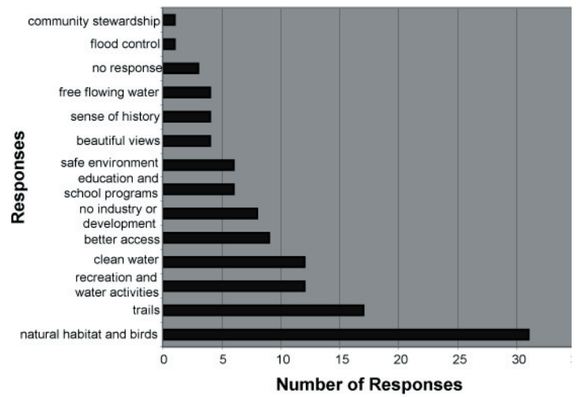
Question: If you do visit the river now, why do you go? (no response was given by those that do not visit)



Question: If you do not visit the river, why not? (no response was given by those that do visit)



Question: What changes would encourage you to visit the river more often?



Question: How would you like to see the river for your children and grandchildren?

Professional Contacts:

Matt Bohan, County of San Diego Department of Parks and Recreation

Dr. Howard Chang, San Diego State University

Dr. Lynne Christenson, County of San Diego Historian

Diane Coombs, San Dieguito River Park

Jeff Harkness, City of San Diego Department of Park and Recreation

James Hubbell, Artist, Santa Ysabel, California

Mike Kelly, Friends of Mission Valley Preserve

Michael Klein, Klein-Edwards Professional Services

Melanie Kush, City of Santee Department of Planning

Jerry Lester, Lakeside Land Company

Jim Peugh, Friends of Famosa Slough

Michael Porter, Region Water Quality Control Board

Dr. Greg Pregill, University of San Diego

Dr. Phil Pryde, San Diego State University

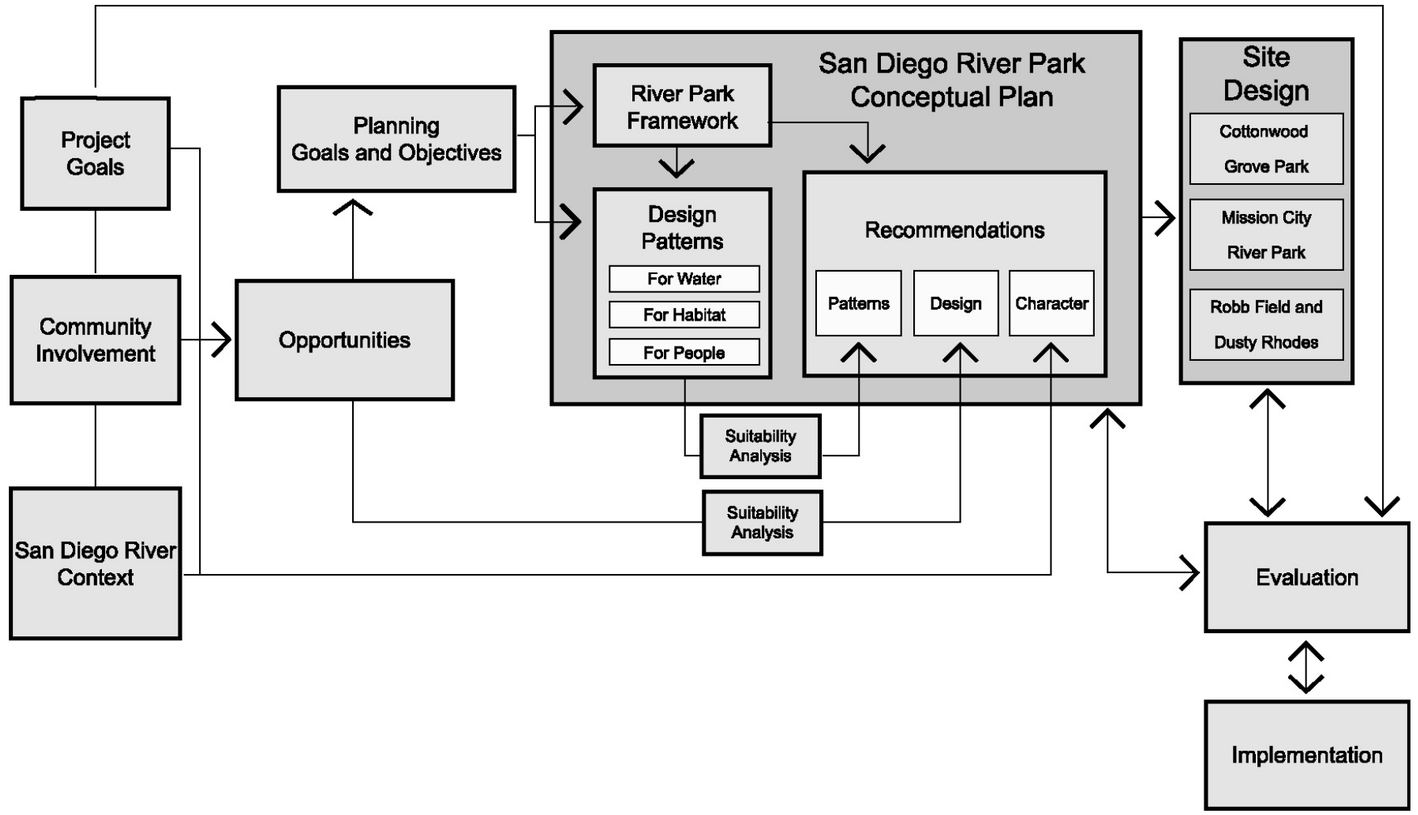
Dr. Ron Quinn, California State Polytechnic University, Pomona

Geoffrey Smith, Sierra Club, San Diego Chapter

Bill White, California History and Culture Conservancy

In addition to workshops, presentations and meetings, members of the project team were invited by Mike Porter of the Regional Water Quality Control Board, to attend a seminar hosted by Ann Riley, author of *Restoring Streams in Cities*. The workshop was held on March 25 and 26, 2002, and included participants from the City of San Diego, San Diego County, local policy makers and agencies. The seminar focused on new methods for riverbank restoration based on restoring and maintaining natural stream processes rather than channelization which, by altering the natural length and slope of streams, leads to increased problems of erosion and maintenance. The concepts and ideas presented in this seminar influenced planning decisions in this document and helped to guide decisions in the formulation of the Conceptual Plan.

Conceptual Plan



Site Design Process

The development of the San Diego River Park Conceptual Plan proceeds directly from the planning goals and objectives, outlining the specific priorities of the design process. The planning goals and objectives differ from the project goals, which were formulated in a first step of the project, in that they were generated in response to the specific opportunities discovered in the analysis for the river park.

The San Diego River Park Conceptual Plan consists of three primary components:

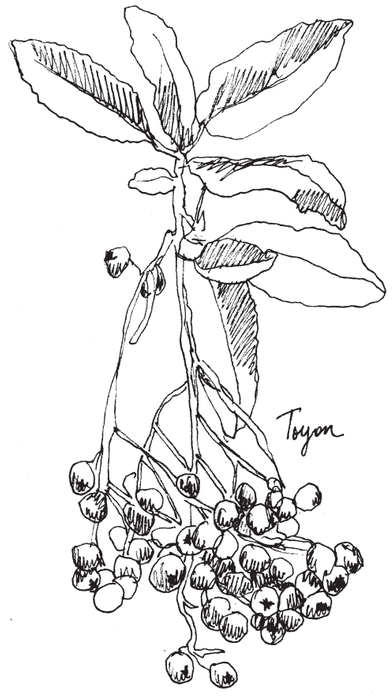
- River Park Framework
- Design Patterns
- Recommendations

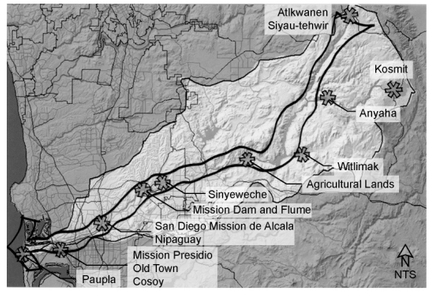
The three pieces of the conceptual plan work together to guide future design of the river park. The River Park Framework illustrates the overall vision for the river park. Design Patterns provide a vocabulary with which to achieve this vision. Recommendations provide specific design guidance for each reach.

	Goals	Objectives
Historical Recognition	To preserve and celebrate the San Diego River's historic resources	1. Develop partnerships with existing historical resources 2. Enhance preservation of historic and cultural resources 3. Facilitate education about the river's rich history
Water Management	To support the natural stream processes of the San Diego River	1. Support sediment transport processes and manage erosion 2. Work toward decreasing flooding and increasing groundwater volumes 3. Improve water quality 4. Educate the public about how their actions impact the river environment
Habitat Enhancement	To preserve and enhance native riparian and upland habitat throughout the San Diego River Park	1. Enhance native habitat 2. Maintain and improve habitat connectivity throughout the park 3. Integrate recreation in such a way as to minimize impacts on sensitive species 4. Facilitate education about the river environment
Recreation	To provide access to recreation activities throughout the San Diego River Park	1. Connect existing recreational facilities 2. Provide a continuous trail along the length of the San Diego River 3. Provide additional recreational opportunities and improve trail connectivity from the region into the river park 4. Maintain and improve the natural aesthetics of the river corridor 5. Enhance educational opportunities along the river

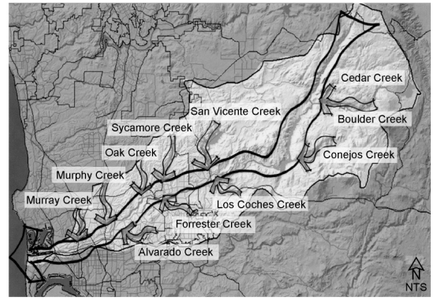
PLANNING GOALS AND OBJECTIVES

Planning goals and objectives, based on opportunities for the river park, were developed for each of the four critical issues: historical recognition, water management, habitat enhancement and recreation. When viewed collectively, these planning goals and objectives form the basis for the subsequent River Park Framework and Design Patterns for the San Diego River Park.

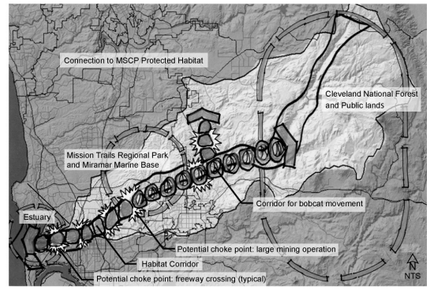




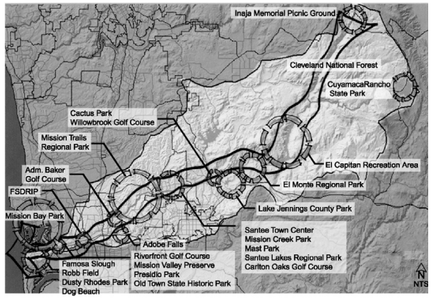
Cultural and historic resources



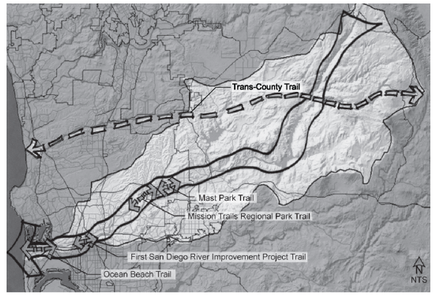
Tributaries



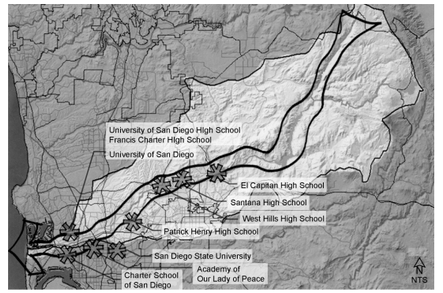
Habitat patches, chokepoints and needed connections



Parks and golf courses



Existing trails



High schools and universities

Overview of River Park Framework components

RIVER PARK FRAMEWORK

Process

The development of the River Park Framework proceeded directly from the planning goals and objectives and is firmly rooted in the river park's context, community involvement and the project goals. The framework illustrates the manifestation of the fully implemented San Diego River Park.

Regional Context

The proposed San Diego River Park does not exist in isolation. It will be an important piece of a regional system of trails, parks and open spaces serving the San Diego region. Its relationships with and connections to existing facilities can greatly enhance its functioning. Trail linkages will be provided to the San Diego Trans-County Trail and into the Cleveland National Forest. Habitat linkages can be provided to connect the river park along San Vicente Creek and through Mission Trails Regional Park to preserved areas in the north including San Dieguito River Park, to Famosa Slough to the south and along Alvarado Creek to the Adobe Falls area.

Overview

The Conceptual Plan for the San Diego River Park represents the vision for the river park as a whole.This vision is unique to the San Diego River while learning and incorporating principles from other river areas. The river park provides greatly expanded opportunities for historical recognition, water management, habitat enhancement and recreation. Continuous trails unify the park and connect the public open spaces located in the river corridor.

Historical Recognition

Historical cultural sites can be recognized and preserved within the river park, giving the public greater understanding of the historical value of the San Diego River. These sites include:

- Town of Julian Historic District
- Old wooden flume from Cuyamaca Reservoir
- Mission Dam and Flume National Historic Landmark
- Mission San Diego de Alcala State Historic Landmark
- Old Town San Diego State Historic Park
- Atlkwanen, Sinyau-tehwir, Kosmit, Anyaha, Witlimak, Senyaweche, Nipaguay, Cosoy, and Paulpa Kumeyaay Villages

To promote these locations, a Historical Interpretive Tour is proposed linking all of these sites along a self-guided tour. The layout of the tour can also highlight historical transportation routes along the river. Interpretive signage at historical locations will provide information about the history, context, significance and preservation of the sites. When seen as a part of the whole tour, these signs will provide a clear indication of the river's important role in California history. Seen individually, they will educate and inform park visitors about the significance of a given spot, and perhaps, inspire park users to visit other areas on the Historical Interpretive Tour in the future. The Historical Interpretive Tour has the potential to become a transect through time, educating the public about the San Diego River's important role in local history.

Water Management

Water management is a critical function of the proposed river park. Generally depicted in the graphic as a net to hold, slow and filter water as it enters the river, improved water management in the river park can provide an enhanced riparian environment. Throughout all areas of the proposed river park, management practices are implemented to improve the hydrological function of the river. Described in detail in River Park Design Patterns for water, some of these practices include maintaining natural river character to support sediment transport processes, maintaining permeable surfaces to reduce runoff into the river and to allow for increased groundwater infiltration, preserving riparian habitat and its natural filtration processes, using vegetated swales to catch and filter runoff from impervious surfaces and using plant-based phytoremediation to pull toxins from groundwater.

The river park provides an outstanding opportunity for public education about water management-related issues. Residents and businesses may engage in activities that are harmful to the river environment only because they are unaware of the adverse consequences of their actions. By taking opportunities to make natural river park processes visible and by using signage to explain these processes, the park can help to create a better-informed public who can then become better stewards of the San Diego River.

Wildlife and Habitat

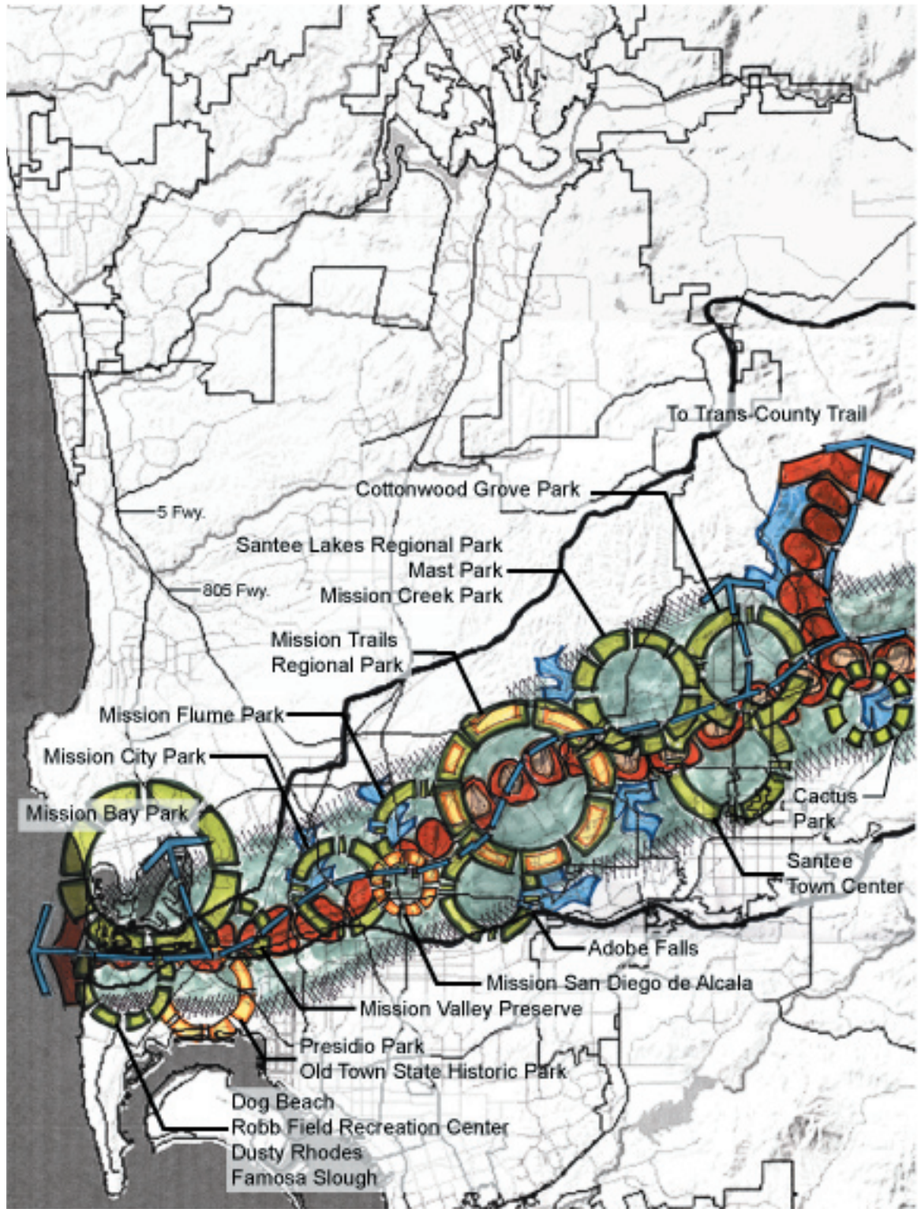
The proposed San Diego River Park provides connected habitat from the large pubic landholdings in the headwaters through rural, suburban and urban environments all the way to the ocean. Habitat restoration can be coordinated throughout the park, and a wildlife corridor can be maintained along the length of the park and potentially connecting along San Vicente Creek and through Mission Trails Regional Park to large habitat areas to the north, This allows for the movement of birds, small animals, reptiles, insects and plants, ensuring better genetic health for the communities within the river park. A corridor for bobcat movement can be maintained between the headwaters and Mission Trails Regional Park, helping to ensure long-term habitat quality within the regional park. Buffering can be used to reduce habitat disturbances and to account for the needs of sensitive species, including rare, threatened or endangered wildlife. Ornamental plantings should be composed of predominantly native species, thus increasing the resources available for native fauna.

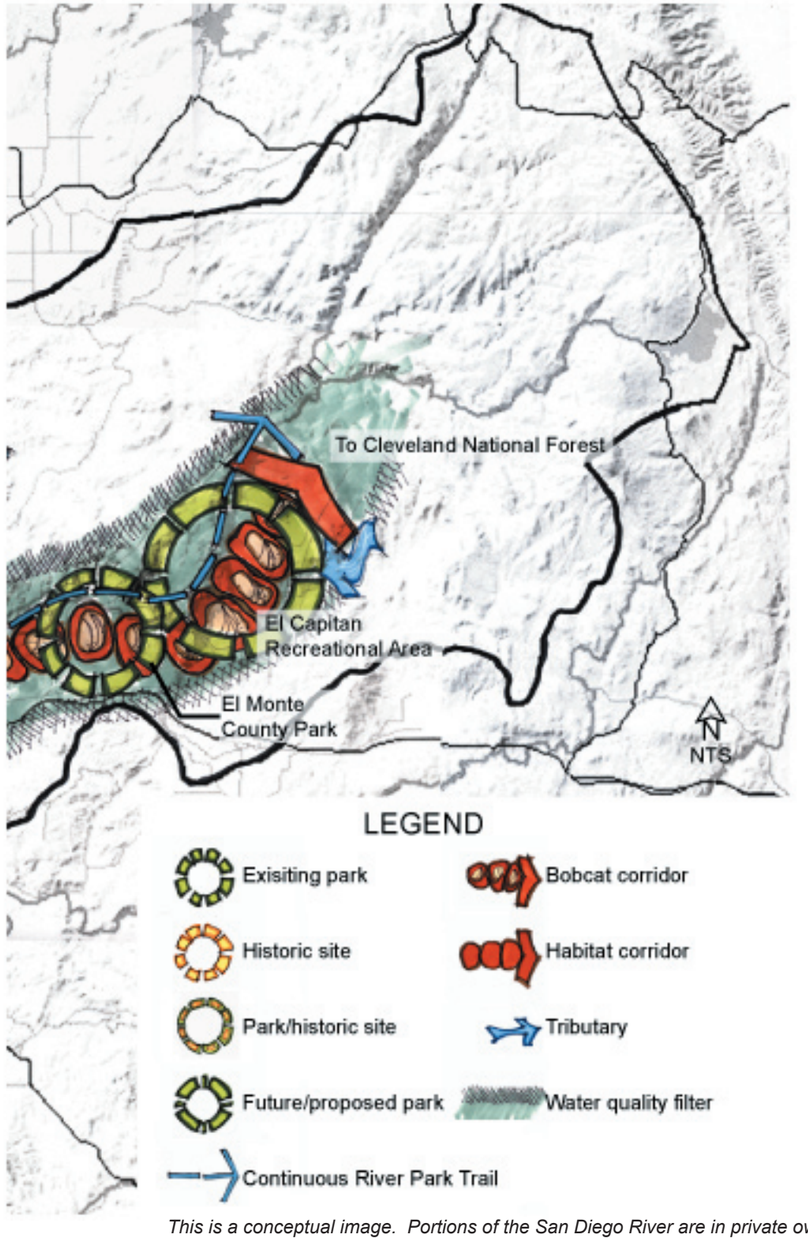
The creation of the river park offers many opportunities for community education and research. Interpretive signage can help the public identify and better understand local wildlife and plants. The park will provide a living laboratory for nature observations and field trips. Community groups, school groups and others can learn about native habitat and propagation techniques by participating in restoration efforts. Local schools and universities can be involved in researching the long term benefits of the establishment of a riparian park in an suburban and urban setting, adding to an increasingly important body of knowledge.

Recreation

The establishment of the San Diego River Park will greatly enhance the current recreational opportunities for the people of the San Diego region. The river park will connect existing recreational areas into a cohesive recreational system. These recreational areas include:

- El Capitan Reservoir
- El Monte County Park
- Cactus Park
- Santee Town Center
- Mission Creek Park
- Mast Park
- Santee Lakes Regional Park
- Mission Trails Regional Park
- FSDRIP
- Adobe Falls
- Mission Valley Preserve
- Presidio Park
- Old Town San Diego State Historic Park
- Mission Bay Park
- Famosa Slough
- Robb Field Recreation Center
- Dusty Rhodes Park
- Dog Beach



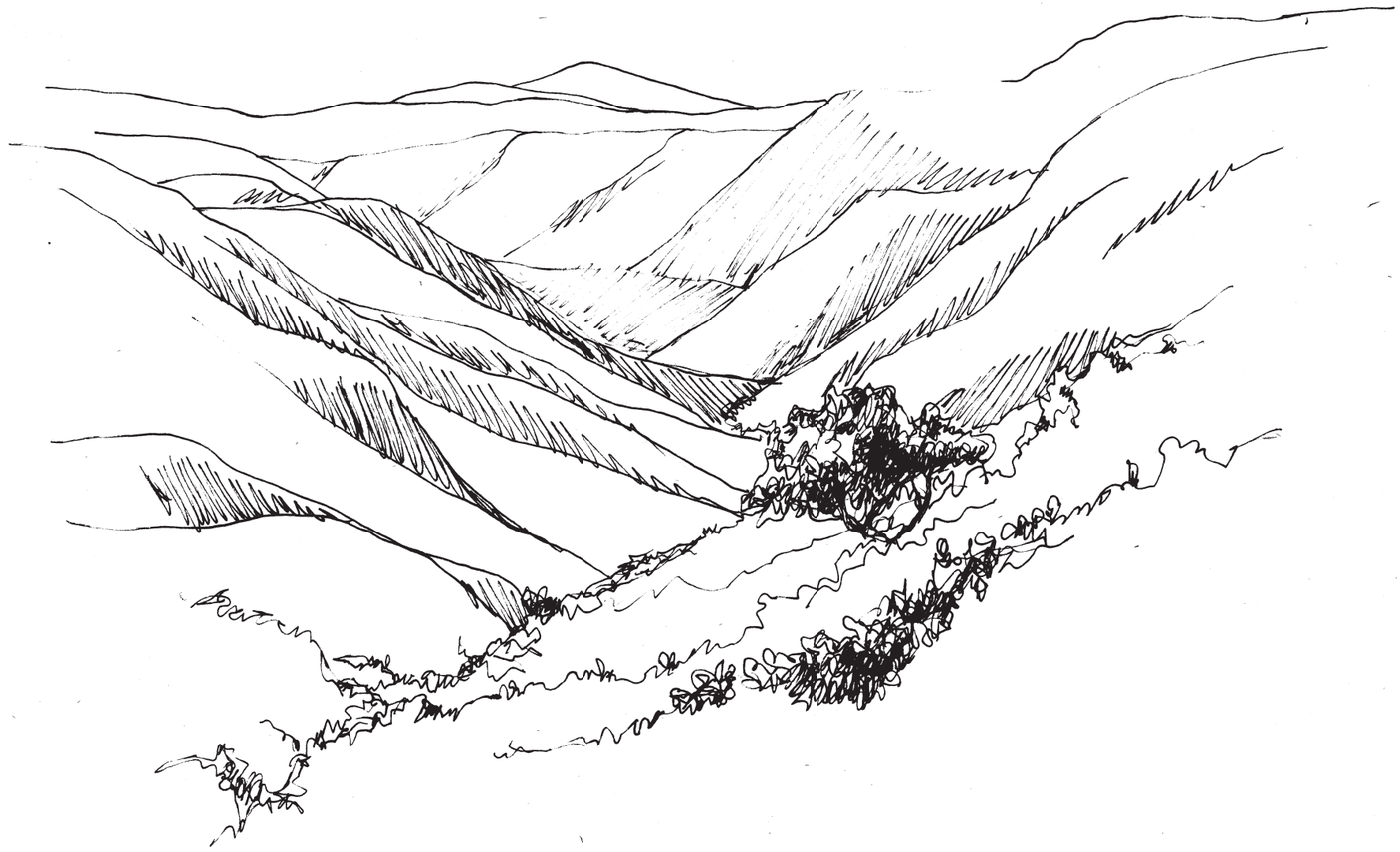


This is a conceptual image. Portions of the San Diego River are in private ownership and access would need to be provided by the owners to be included in the park

San Diego River Park Framework illustrating the overall vision of the Conceptual Plan

Existing isolated trails in Santee, Mission Trails Regional Park, Mission Valley and the estuary can be connected into a unified trail system. In densely populated areas such as Mission Valley and in rapidly growing areas such as Lakeside, additional recreational resources are badly needed. By providing recreational opportunities in areas that serve the multiple functions of historic preservation, water management and habitat preservation, recreational resources can be made more cost-effective. The San Diego River Park Trail, a connected trail for bicycles and pedestrians throughout the park, will serve as the unifying thread of the river park and will offer recreational opportunities and better access to existing park facilities.

A connected recreational system throughout the San Diego River watershed will be a great asset to the local community, providing thousands of people access to Southern California's dwindling natural environments. Recreational fields, picnic areas, playgrounds, horse trails, and wildlife view spots, as described in River Park Design Patterns for people, (listed in the following pages), can all be accommodated here in a sustainable and harmonious way.

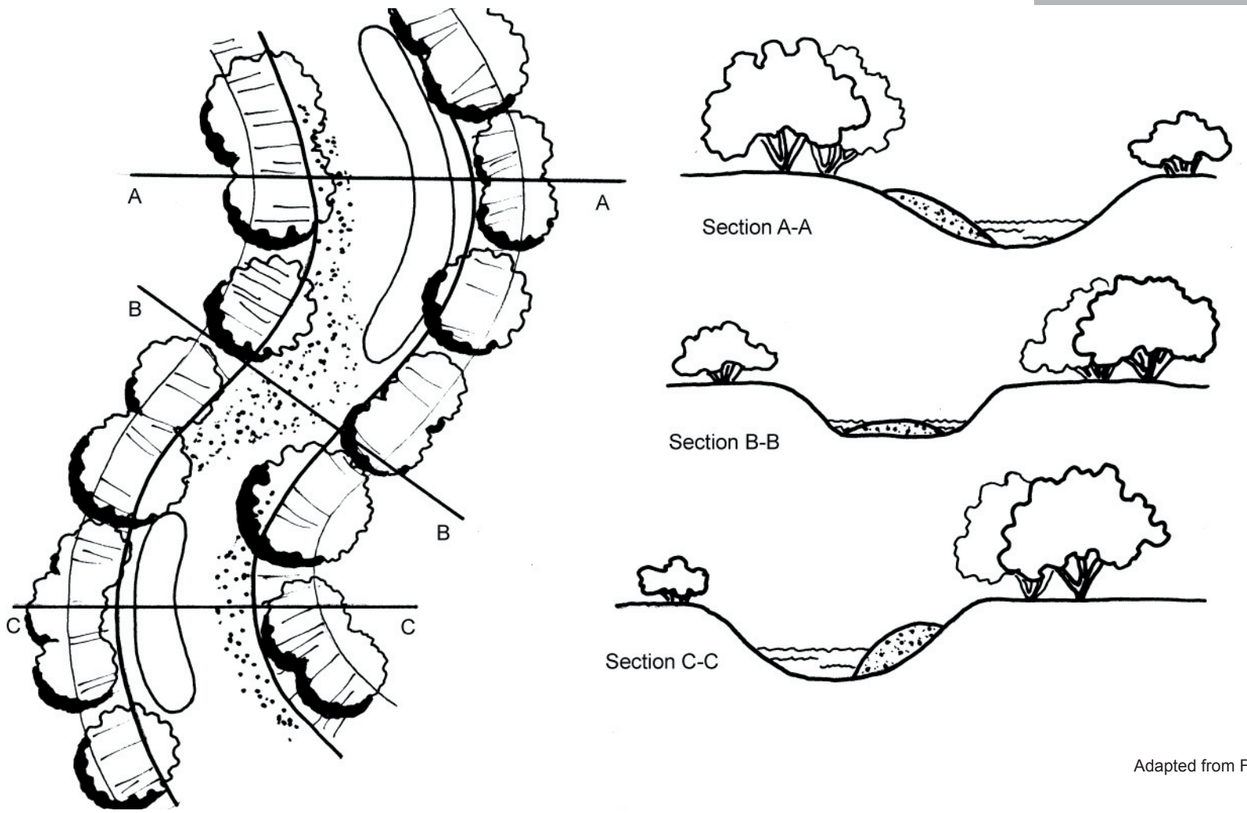


DESIGN PATTERNS

Process

To facilitate the planning of this large river park, covering many jurisdictions and incorporating both existing and future parks, Design Patterns were developed to ensure that future designs are sensitive to the unique characteristics and needs of the San Diego River. Based on the planning goals and objectives for the river park, these patterns provide a design language for use within the park. The use of these patterns will ensure that the river park is developed in a cohesive and sensitive manner.

The Design Patterns are organized into three broad categories: patterns for water, habitat and people. In the description of each Design Pattern, the purpose for the inclusion of each pattern in the river park design is included. This is followed by descriptions of the appropriate placement and guidelines for each pattern. Finally, associated patterns likely accompany each pattern are presented.



Adapted from Flink, 1993

W-1. Stream Meanders

Purpose

To stabilize the natural flow, form and function of a stream. By maintaining the natural physical configuration of a stream, water velocity can be reduced, thus decreasing erosion potential and sediment removal, water quality can be improved by allowing more time for natural cleansing processes, and habitat can be improved by providing an increased variety of aquatic and terrestrial environments. Allowing enough room for natural stream processes to work can reduce construction and maintenance costs.

Placement

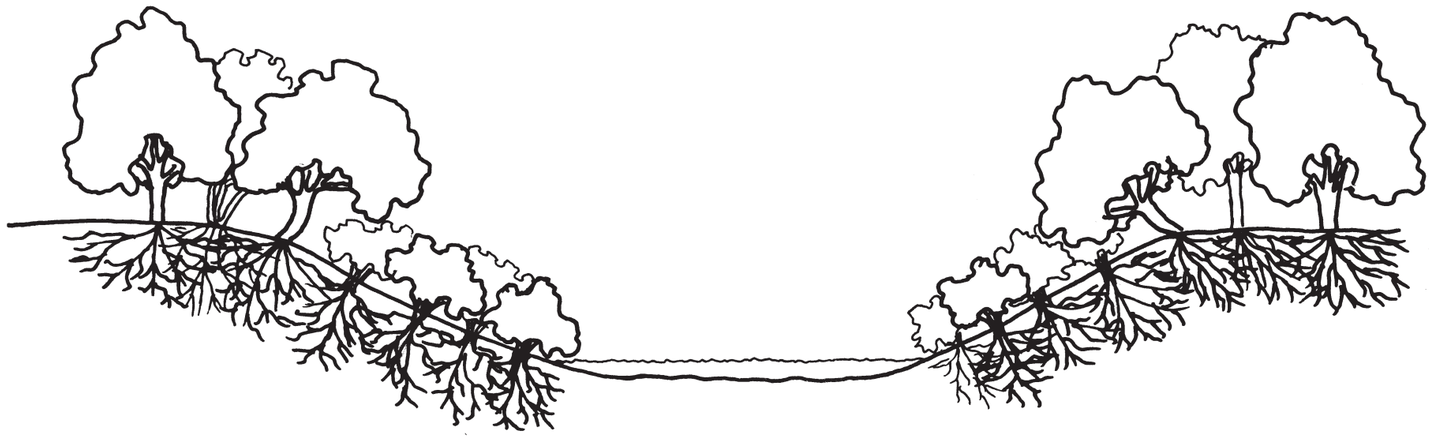
Stream meanders, as opposed to straight river channels, should be maintained and created in the river and its tributaries wherever possible. Surface drainage areas should also meander. Meanders require increased stream corridor width, which is beneficial to habitat as well as water quality and quantity.

Guidelines

- Discourage stream straightening and channelization as solutions to flooding issues
- Restore natural meanders in the river and all tributaries
- Slow and capture stormwater runoff before it enters streams and becomes a flooding problem
- Preserve the flood plain and allow natural processes to clean and slow stormwater
- Use meanders as a way to increase the length and area of stream channels, providing for better stormwater management, better water quality and better habitat

Associated Patterns

- Stream bank restoration (W-2)
- Habitat restoration (H-1)



W-2. Stream Bank Restoration

Purpose

To enhance the natural form and functioning of the river and its tributaries by improving soils and topsoil formation, reducing erosion, improving habitat, and improving water quality. Maintenance costs are reduced when healthy stream banks resist erosion. The aesthetic environment for park visitors can also be improved by providing lush riverside vegetation.

Placement

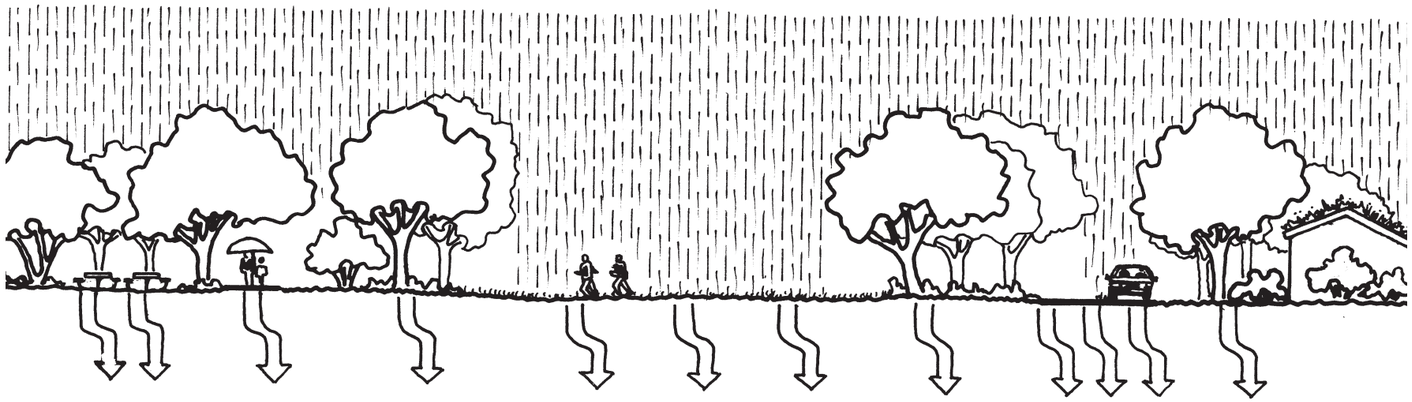
Stream bank restoration should occur at locations on the river or its tributaries that are without vegetation, eroding, or in an otherwise degraded state.

Guidelines

- Use native riparian vegetation to secure banks
- Discourage using rocks to prevent stream bank erosion; a healthy vegetated community can function better
- Use vegetation to regulate the microclimate of stream
- Use biotechnical engineering techniques (whole plants or their parts) to secure unstable slopes and banks, such as willow waddling or woody debris
- Discourage channelization and dam construction
- Include signage to educate the public about the restoration process

Associated Patterns

- Stream meanders (W-1)
- Habitat restoration (H-1)
- Interpretive signage (P-11c)



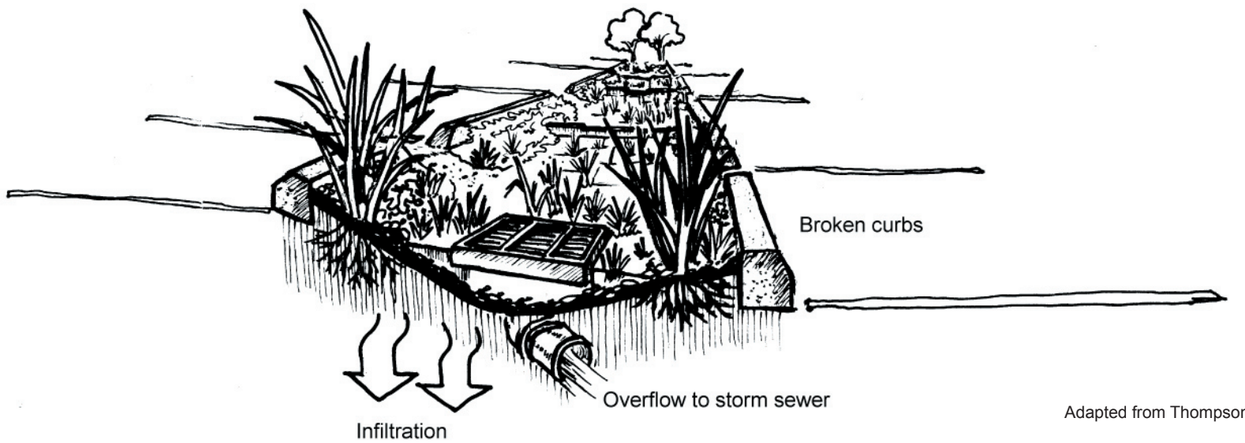
W-3. Infiltration Zones

Purpose
To slow and decrease storm water runoff into the river, reducing flooding and erosion and increasing groundwater infiltration, by bringing water into prolonged contact with soil at every possible opportunity. Green roofs, roof surfaces planted with drought tolerant vegetation, are a type of above ground infiltration zone.

Placement
Infiltration zones should replace paved and impervious surfaces at all possible opportunities. Parking areas and paths should be unpaved when appropriate. New buildings should be constructed with vegetated green roofs, and older buildings should be considered for retrofitting.

Guidelines
- Preserve existing permeable areas
- Use planted or permeable surfaces to replace paved areas ranging from parking lots to access roads, to trails and staging areas
- Use green roofs

Associated Patterns
- Parking areas (P-4)
- Playgrounds (P-16)
- Recreational fields (P-20)
- Golf courses (P-21)
- Trails (P-6)
- Picnic areas (P-17)
- Amphitheaters (P-18)
- Access points (P-1)
- Maintenance centers (P-15)



Adapted from Thompson, 2000

W-4. Vegetated Swales

Purpose

To slow, filter and clean stormwater runoff and to increase groundwater infiltration.

Placement

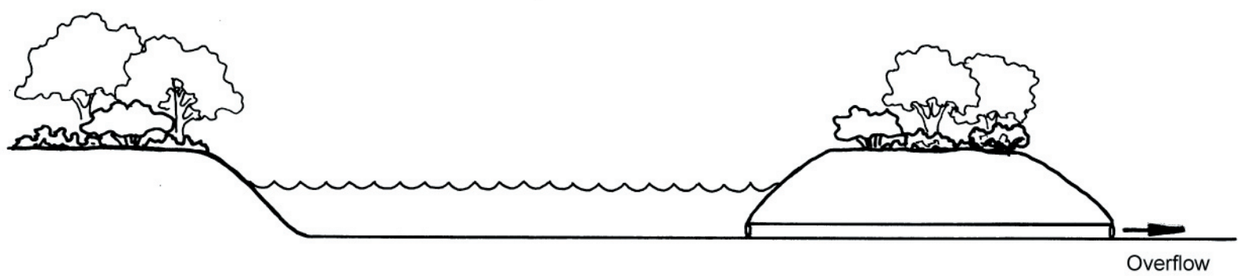
Vegetated swales should be located at the edges of all impermeable or paved surfaces and horse trails within the river park, especially along roads, parking areas and horse facilities.

Guidelines

- Maintain desired vegetation in swale at all times, fine bladed grass and legume mixtures are most effective at pollutant removal
- If swale vegetation is not native, it should not be spreading or invasive
- Remove woody volunteer plants to keep swale clear
- Utilize "broken" curbs or no curbs along edges of impermeable surfaces to allow runoff to flow into swale areas
- Design swale areas to contain and filter the most polluted runoff, collected the first five minutes of a small storm event.
- Utilize a raised drain inlet at the lowest point in the buffer area to allow for overflow drainage
- Keep free of trash and debris
- Include signage to educate the public about the function of the swale

Associated Patterns

- Parking (P-4)
- Commercial edges (P-22)
- Interpretive signage (P-11c)
- San Diego River Park Trail (P-6a)
- Horse Facilities (P-5)
- Bike facilities (P-2)



Adapted from Ferguson, 1998

W-5. Dry Detention Basins

Purpose

To decrease runoff into the river and to recharge the aquifer by creating topographic depression areas for infiltration. Dry detention basins are typically dry depressions except after a major rainstorm when they temporarily fill with stormwater. These basins slow the rate at which stormwater from developments enters streams and rivers and thus help prevent flooding. However, dry detention basins are not very effective at removing pollutants.

Placement

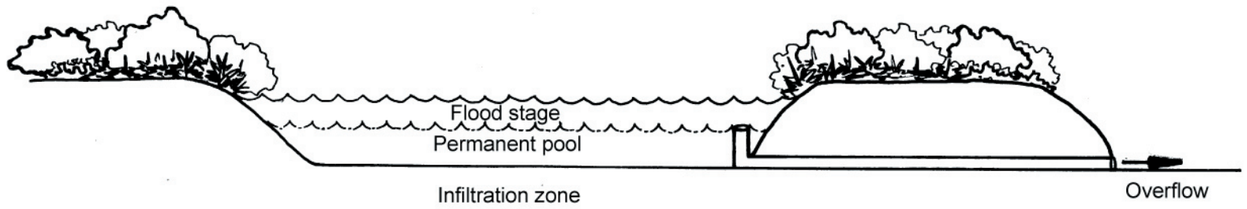
Dry detention basins should be located in areas where groundwater recharge is necessary and where increased infiltration will not lead to further spreading of contaminated groundwater. Basins should only be designed in areas with highly permeable soils or where the aquifer is at or near the surface. Detention and retention basins can be located to collect runoff from impermeable surfaces in the river park.

Guidelines

- Plant with vegetation that can withstand periods of extreme wet and dry
- Inspect basins after storm event to remove debris
- Keep vegetation on edges to decrease erosion
- Monitor for sediment accumulation
- Remove sediment accumulation when necessary, approximately every 5-10 years
- Include signage to educate the public about the purposes of basins

Associated Patterns

- Parking (P-4)
- Commercial edges (P-22)
- Interpretive signage (P-11c)
- Native landscaping (H-6)



Adapted from Ferguson, 1998

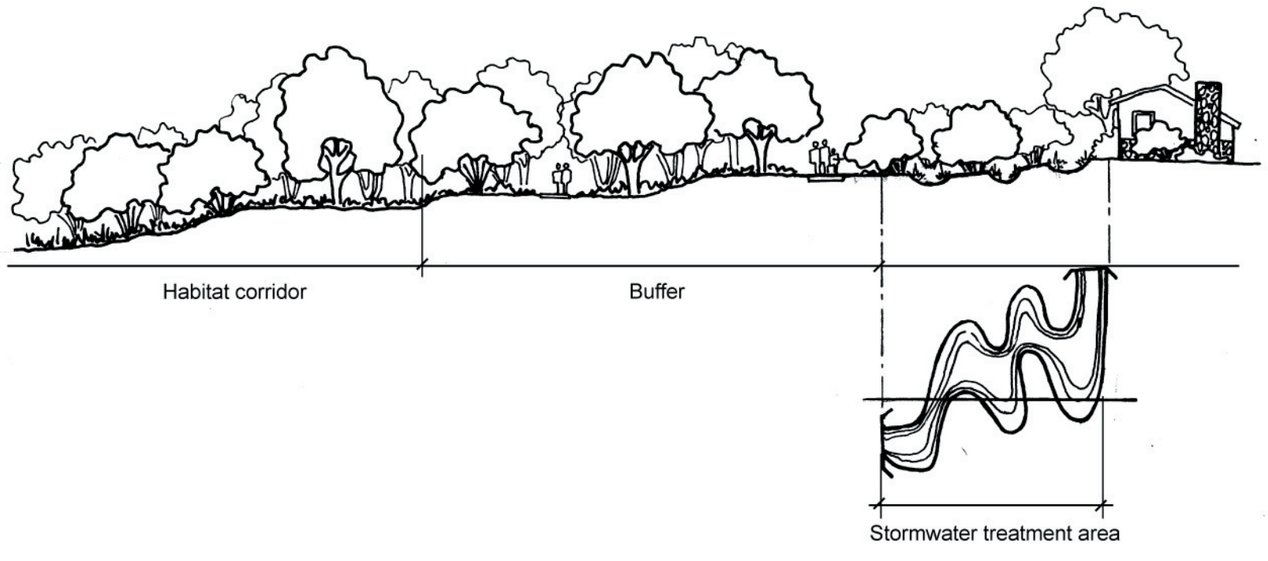
W-6. Retention Basins / Wetlands

Purpose
To decrease runoff into the river, to recharge the aquifer by creating topographic depression areas for infiltration, and to remove pollutants from stormwater. Retention basins typically have a permanent pool of water that can serve as wetland habitat and improve water quality through natural processes.

Placement
Retention basins should be located in areas where ground water recharge is necessary and where increased infiltration will not lead to further spreading of contaminated groundwater. Basins should only be designed in areas with highly permeable soils or where the aquifer is at or near the surface. Retention basins can be located to collect runoff from impermeable surfaces in the river park. The open water and wetland habitat created by retention basins can be considered an amenity and add focus and interest to a site.

Guidelines
- Maintain native wetland vegetation within basins to provide increased habitat
- Inspect basins after storm event to remove debris
- Keep edges well vegetated to decrease erosion
- Monitor for sediment accumulation
- Remove sediment accumulation when necessary, approximately every 5-10 years
- Include signage to educate the public about the purposes of basins

Associated Patterns
- Parking (P-4)
- Commercial edges (P-22)
- Interpretive signage (P-11c)
- Native landscaping (H-6)
- Habitat restoration (H-1)



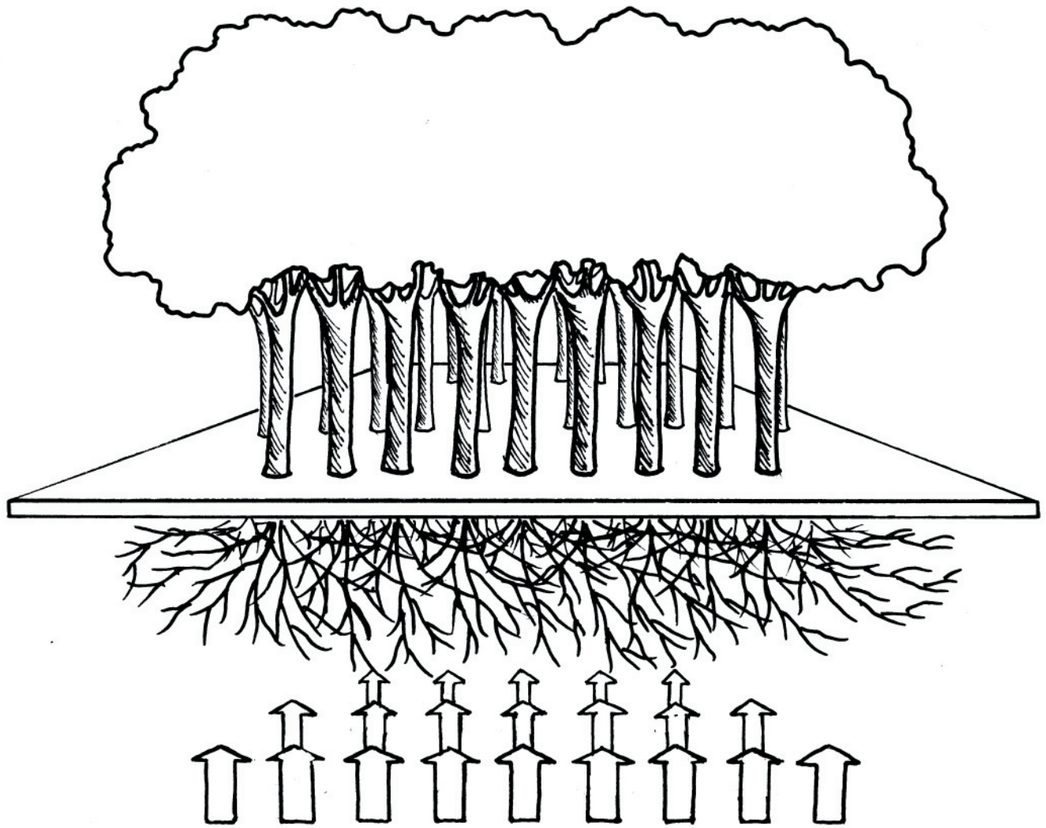
W-7. Stormwater Treatment Areas

Purpose
To filter and clean stormwater runoff currently flowing in storm drains to the river or its tributaries, before contaminated water enters the river or its tributaries.

Placement
Stormwater treatment areas should be located in areas where storm sewers are located and where there is sufficient room to treat stormwater before it is discharged into the river. These treatment areas can be seen as amenities and placed in conjunction with picnic areas, view spots and trails (see Appendix J for further guidance regarding making ecological processes visible). Stormwater treatment should not occur in corridor, buffer or sensitive species areas where it would displace natural habitat. Stormwater treatment, if undertaken within the one hundred year flood plain, will require increased maintenance to remove contamination as it accumulates to prevent concentrated toxins from the filtration process from being washed into the river during flood events.

Guidelines
- Bring stormwater and urban runoff to the surface from local stormwater pipes for the purpose of cleansing and filtration
- Design system capacity to clean and filter the first inch of stormwater, as this water contains the highest concentrations of pollutants
- Utilize a designed riparian system containing collectors for trash, detention areas for slowing and sediment precipitation, and vegetated swales for filtration
- Provide for overflow in large storm events to prevent scouring of filtration areas
- Utilize native vegetation within the system such as rushes, sedges, western sycamores and willows

Associated Patterns
- Interpretive signage (P-11c)
- View spots (P-8)
- Picnic areas (P-17)
- Spur trails (P-6b)



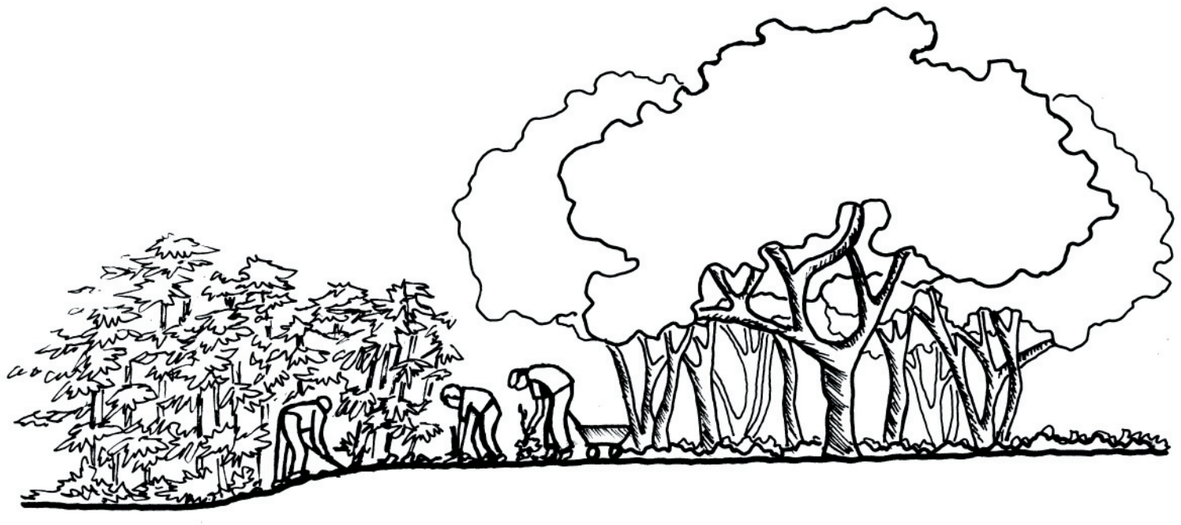
W-8. Phytoremediation

Purpose:
To remediate and restore riparian habitat sites from groundwater contaminants and toxic substances, such as MTBE, using inexpensive planting techniques as opposed to expensive, energy-intensive engineering solutions.

Placement:
Phytoremediation should be considered in areas where toxic soils or contaminated shallow groundwater is present. Phytoremediation should not occur in corridor, buffer or sensitive species areas where it would displace natural habitat.

Guidelines:
- Utilize plants to take-up, sequester and/or break down toxic contaminants
- Utilize native plants where applicable, or noninvasive exotic plants if necessary
- Do not utilize edible or fruiting plants or plants that are heavily consumed by native wildlife
- Design and monitor a system of test wells to gauge the effectiveness of treatment
- Develop an educational component involving the local community or schools, focusing on monitoring for site improvements over time

Associated Patterns:
- Interpretive signage (P-11c)



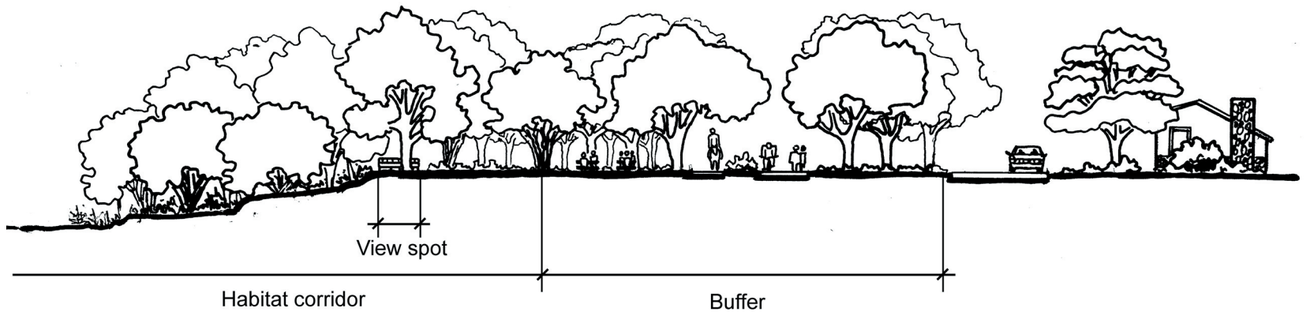
H-1. Habitat Restoration

Purpose
To increase the quality and extent of the natural habitat within the river park, eliminating invasive exotic species and reestablishing healthy populations of native species.

Placement
Habitat restoration should occur throughout the river park wherever invasive exotics exist or where natural communities are degraded or absent.

Guidelines
- Coordinate restoration efforts on a park-wide or watershed-wide basis, working with existing community groups currently involved in restoration on the river
- Prioritize exotic species removal efforts in the river park, first focusing on those species causing the greatest harm to native species and hydrological patterns or those spreading most rapidly
- Develop native revegetation strategies based on historic community distribution and the needs of sensitive species within the river park
- Revegetate the park with only local native species:
  - o Plants for revegetation should be raised from seeds and cuttings from plants growing on or adjacent to the San Diego River
  - o When this is not possible, plants should be raised from seeds and cuttings from the nearest local populations with similar conditions to the San Diego River
  - o Commercially grown plants should be avoided as they can be genetically very different from local native populations
- Inoculate planting areas during restoration with native mycorrhizal fungi to encourage the better establishment of native species and to discourage colonization by exotic species
- Develop maintenance strategies for restored vegetation, including ways to compensate for the loss of periodic fires as a natural process of renewal and regeneration within the river park
- Develop an education program to inform local park neighbors about potential threats to habitat quality within the park, such as using invasive plants in yard landscaping and allowing cats and dogs to hunt within the park
- Conduct educational outreach to inform local nurseries about the impacts of selling invasive plants

Associated Patterns
- Bobcat corridor (H-3)
- Riparian habitat corridor (H-2)
- Sensitive species areas (H-5)
- Maintenance centers (P-15)
- Interpretive signage (P-11c)



H-2. Habitat Corridor

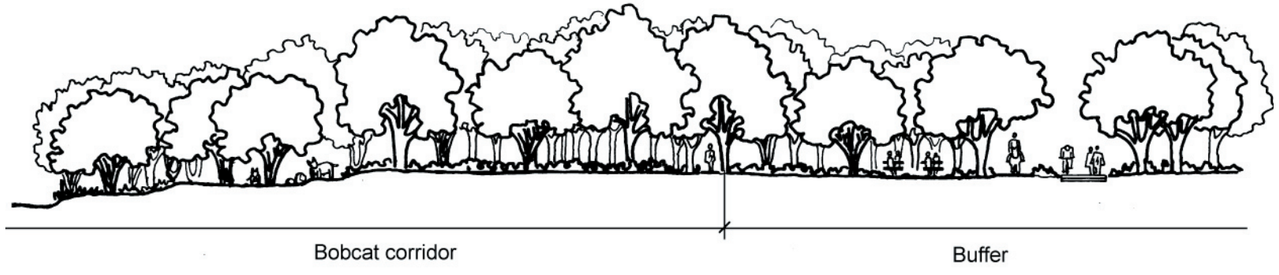
Purpose
To maintain habitat connectivity for wildlife and plant species throughout the entire river park in order to help maintain overall community health and vigor.

Placement
The habitat within the riparian corridor should be maintained intact along the length of the river park and should extend outside of the park to make connections to adjacent critical habitat areas. The corridor should be as wide as possible, but with a minimum width determined through consultation with a wildlife biologist. The corridor should be surrounded on each side by a 25- to 100-foot buffer area of habitat (see Appendix H for further guidance regarding corridor design).

Guidelines
- Allow for limited activities only within the corridor: walking, biking, fishing, bird-watching
- Allow for increased, but still limited, activities within the buffer areas: horse riding, picnicking
- Allow high impact activities outside of buffer areas only: sports, playground activities, parking
- Develop a management plan to maintain and/or restore riparian and other habitat within the corridor
- Study the impacts of road and freeway crossings within the corridor, and develop strategies for better connectivity, if necessary, such as speed bumps, stop signs or wildlife underpasses
- Provide for limited lighting in the buffer areas during dawn and dusk hours, but do not provide lighting within the corridor area
- Develop an education program to help park users and local residents understand the corridor and its purpose, thus fostering better stewardship

Associated Patterns
Riparian habitat corridor:
- Spur trails (P-6a)
- View spot (P-8)
- Benches (P-13)
- Water access (P-9)
- Wildlife underpasses (H-4)
- Habitat restoration (P-1)
- Regulatory signage (P-11d)
- Interpretive signage (P-11c)

Buffer area:
- San Diego River Park Trail (P-6a)
- Horse trails (P-6c)
- Picnic area (P-17)
- Lighting and emergency phone (P-12)
- Kiosk (P-10)
- Amphitheater (P-18)
- Habitat restoration (H-1)
- Native landscaping (H-6)



H-3. Bobcat Corridor

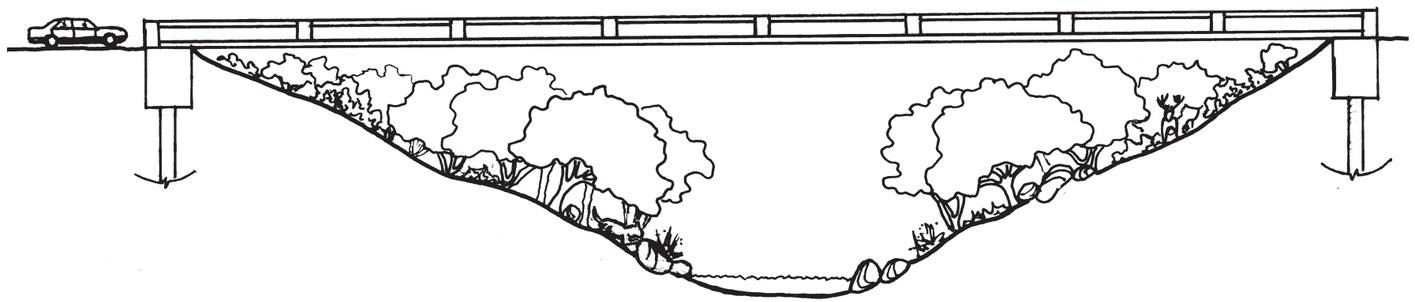
Purpose
To maintain habitat connectivity for bobcats and other species between Cleveland National Forest and Mission Trails Regional Park in order to help maintain overall community health within Mission Trails Regional Park.

Placement
The habitat within the riparian corridor should be maintained intact for bobcat movement along its length. Currently, bobcat movement does occur in this corridor, park design must ensure that this continues. The corridor should be as wide as possible, with a minimum width determined through consultation with a wildlife biologist. The bobcat corridor should be surrounded on each side by a 25 to 100 foot buffer area of habitat. (See Appendix H for further guidance regarding corridor design).

Guidelines
- Allow for limited daytime activities only within the corridor: walking, fishing, bird-watching
- Allow for increased, but still limited, activities within the buffer areas: biking, horse riding, picnicking
- Allow high impact activities outside of buffer areas only: sports, playground activities, parking
- Develop a management plan to maintain and/or restore habitat suitable for bobcat movement within the corridor
- Study the impacts of road and freeway crossings within the corridor, and develop strategies for better connectivity, if necessary, such as speed bumps, stop signs or wildlife underpasses
- Provide for limited lighting in the buffer areas during dawn and dusk hours, but do not provide lighting within the corridor area
- Develop an education program to help park users and local residents to understand the corridor and its purpose, thus fostering better stewardship

Associated Patterns
Bobcat corridor:
- Spur trails (P-6b)
- View spots (P-8)
- Benches (P-13)
- Water access (P-9)
- Wildlife underpasses (H-4)
- Habitat restoration (H-1)

Buffer area:
- San Diego River Park Trail (P-6a)
- Horse trails (P-6c)
- Picnic areas (P-17)
- Lighting and emergency phones (P-12)
- Kiosks (P-10)
- Amphitheaters (P-18)
- Habitat restoration (H-1)
- Native landscaping (H-6)



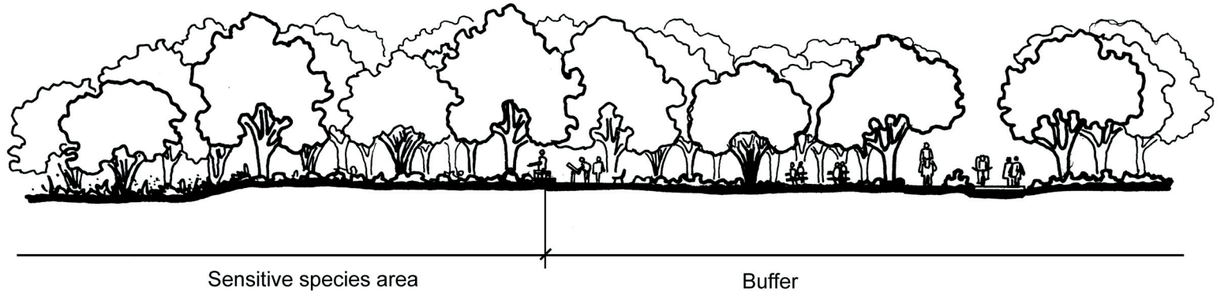
H-4. Wildlife Underpasses

Purpose
To increase habitat connectivity and facilitate better wildlife movement within the river park in areas where connectivity is otherwise lost.

Placement
Wildlife underpasses should be located in areas, determined through research, where roads and freeways bisect the river park, hindering connectivity.

Guidelines
- Work with local universities, volunteers or consultants to conduct monitoring and research on wildlife connectivity issues in the river park
- Design underpasses to suit the needs of specific species requiring better connectivity, as determined through research
- Design any new roads through the river park with special consideration of the wildlife connectivity needs of park species

Associated Patterns
- Bobcat corridor (H-3)
- Riparian habitat corridor (H-2)
- Sensitive species areas (H-5)



H-5. Sensitive Species Areas

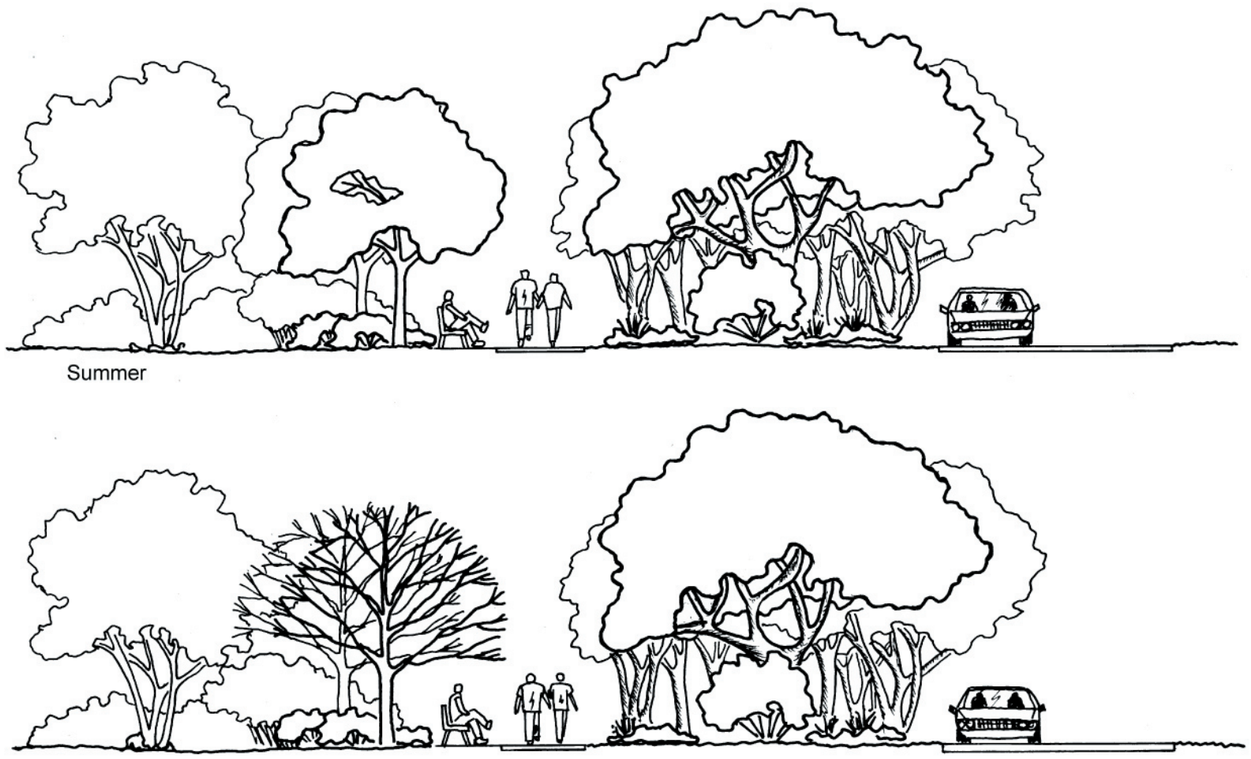
Purpose
To protect sensitive species and their habitat within the river park.

Placement
Sensitive species areas should be established in areas where endangered, threatened or sensitive species utilize the river or are likely to utilize the river. Biological research is necessary to determine precise locations and buffer sizes. Sensitive habitat areas should be surrounded by 25-100 foot buffers where only limited, low-impact activities are allowed.

Guidelines
- Allow only low-impact activities appropriate to the sensitive species present in the area, such as walking and bird watching, with some areas set aside exclusively for habitat with no recreational uses when it is necessary for its survival.
- Establish buffer areas around sensitive habitat where increased, but still limited, activities can take place such as biking, horse riding, fishing, picnicking
- Allow high impact activities outside of buffer areas only: sports, playground activities, parking
- Provide non-constructed access deterrents, such as signage, absence of trail access, landscaping with thorny plants
- Limit the use of fences whenever possible, but if necessary, construct them in ways sensitive to wildlife movement
- Work with local universities and high schools to conduct monitoring and research of sensitive species in the river park
- Develop adaptable strategies to suit the changing needs and locations of sensitive species
- Develop an educational program to help park users and local residents to understand the sensitive habitat areas and their purposes, thus fostering better stewardship

Associated Patterns
Sensitive Habitat Area:
- Spur Trails (P-6b)
- View Spots (P-8)
- Benches (P-13)
- Habitat Restoration (H-1)
- Signage (P-11)

Buffer Area:
- San Diego River Park Trail (P-6a)
- Horse trails (P-6c)
- Picnic areas (P-17)
- Water access (P-9)
- Lighting and emergency phones (P-12)
- Kiosks (P-10)
- Amphitheaters (P-18)
- Habitat Restoration (H-1)
- Native Landscaping (H-6)



Summer

Winter

H-6. Native Landscaping

Purpose
To provide shade, beauty and habitat benefits for the river park, and to reinforce the sense of place along the river corridor.

Placement
Native landscaping should be located in areas where shade, beauty, visual buffering, wind buffering or high quality habitat is desired. Plants should be chosen and located based on their individual specific cultural requirements.

Guidelines
- Utilize only species native to the San Diego River and San Diego region for landscaping within the river park, with the exception of turf areas for play and ball fields
- Ensure that any nonnative plant species currently in the river park are not invasive in the local region
- If needed, install temporary drip or low flow irrigation to irrigate native landscaping until plants become established
- Maintain vegetation by thinning and pruning as needed to promote safety and visual access in the river park and along trails
- Weed out competitive nonnative plants as they appear

Associated Patterns
- Access points (P-1)
- Parking (P-4)
- Public transit access (P-3)
- Playgrounds (P-16)
- Amphitheaters (P-18)
- Recreational fields (P-20)
- Golf courses (P-21)
- Picnic areas (P-17)
- Maintenance centers (P-15)
- Benches (P-13)
- View spots (P-8)

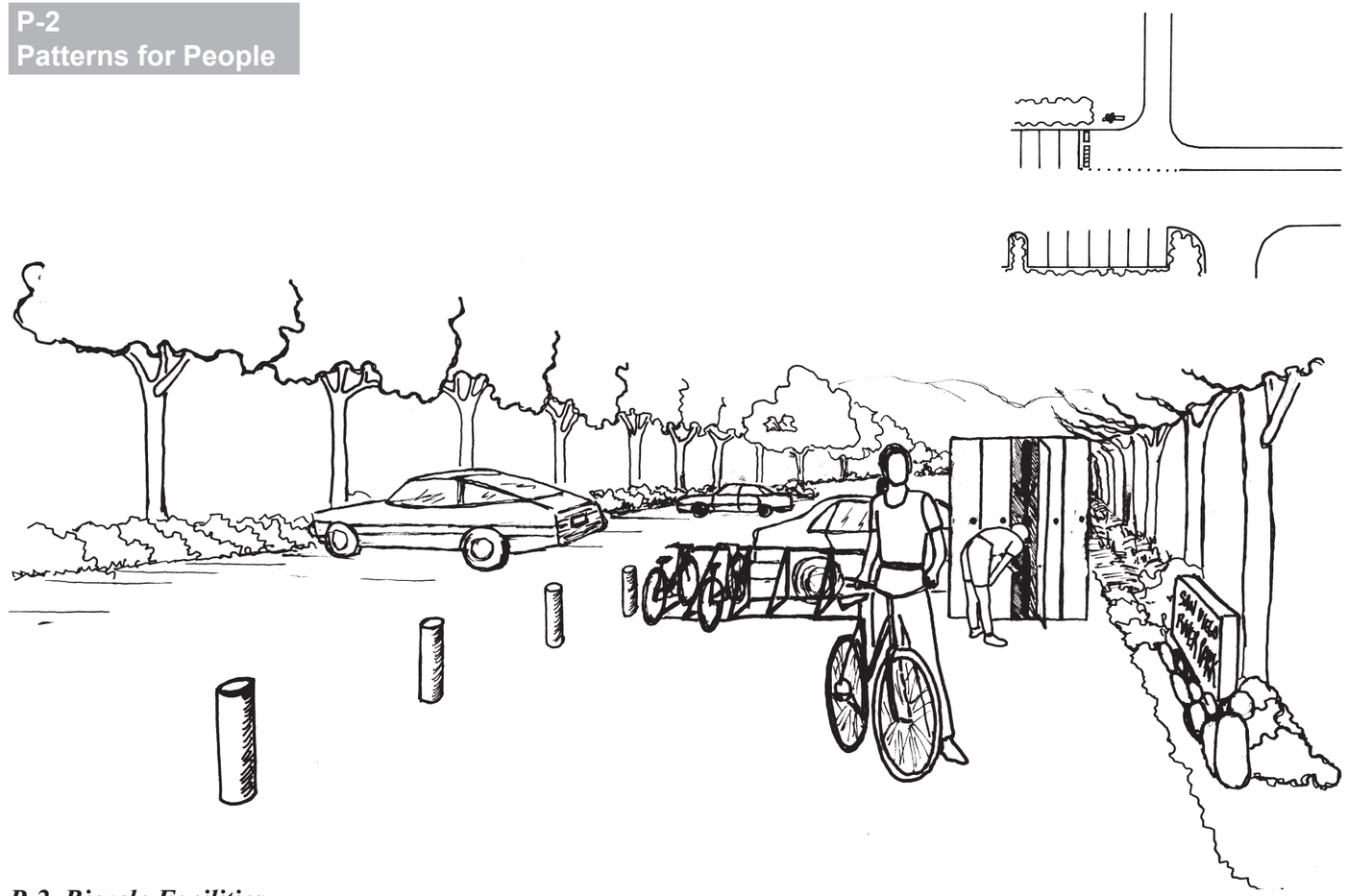
P-1. Access Points

Purpose
To provide convenient access to the trails and facilities of the river park.

Placement
Access points should be located at all locations where the public enters the river park. Current access spots should be improved and new access areas should be developed. Generally, access points should occur at a minimum of every five miles along the river park, but may be more frequent in urban areas. Access areas should be located near parking, public transit access, bicycle and horse facilities. Features such as picnic areas, ball fields, amphitheaters and playgrounds should be located near access points.

Guidelines
- Allow sufficient maneuvering room for trail users
- Create a sense of place and feeling about the river park, as these areas give visitors their first impressions
- Provide security gate, fencing or barriers if necessary to prevent unauthorized park access, but design these to be unobtrusive and blend into the landscape

Associated Patterns
- Parking (P-4)
- Public transit access (P-3)
- Signage (P-11)
- Bicycle facilities (P-2)
- Horse facilities (P-5)
- Restrooms (P-14)
- Native landscaping (H-6)
- Lighting and emergency phones (P-12)
- Picnic areas (P-17)
- Recreational fields (P-20)
- Amphitheaters (P-18)
- Playgrounds (P-16)



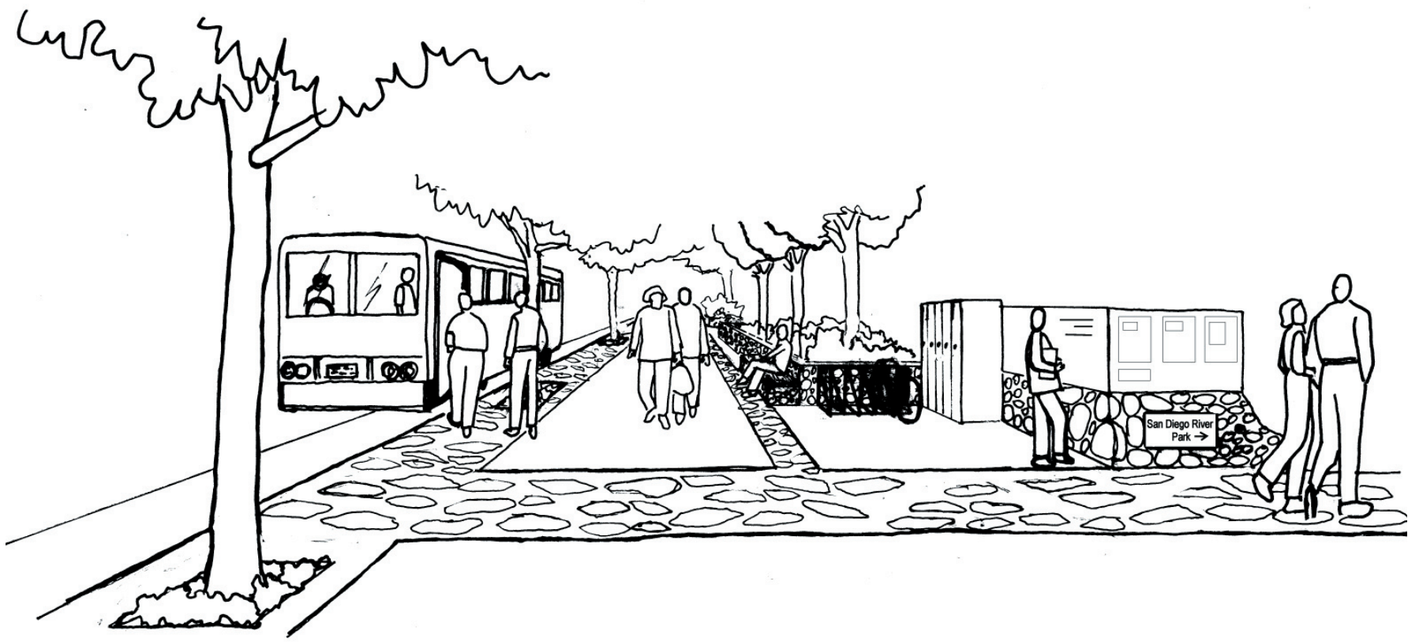
P-2. Bicycle Facilities

Purpose
To encourage bicycle use of the river park trails by providing a staging area for bicyclists, providing a safe place to store bicycles and by providing for bicyclists' needs.

Placement
Bicycle facilities should be provided, generally at a minimum of one per five trail miles, at river park access points. Bicycle facilities should be located near public transit access, ball fields, picnic areas, amphitheaters, and playgrounds. These facilities should not be located within bobcat corridor areas, riparian corridor areas or sensitive habitat areas.

Guidelines
- Provide bike racks for short-term bicycle locking and bike lockers for long term bicycle locking, depending on location
- Provide air pumps for inflating bicycle tires
- Provide water fountains when possible
- Provide trail maps with mileage and difficulty information
- Develop an outreach program to inform bicyclists of trail sharing and habitat issues involving bicycles within the river park, thus-fostering stewardship

Associated Patterns
- Access point (P-1)
- Road crossings (P-7)
- Public transit access (P-3)
- Recreational fields (P-20)
- Playgrounds (P-16)
- Amphitheaters (P-18)
- Native landscaping (H-6)
- Picnic areas (P-17)
- Signage (P-11)
- Lighting and emergency phones (P-12)



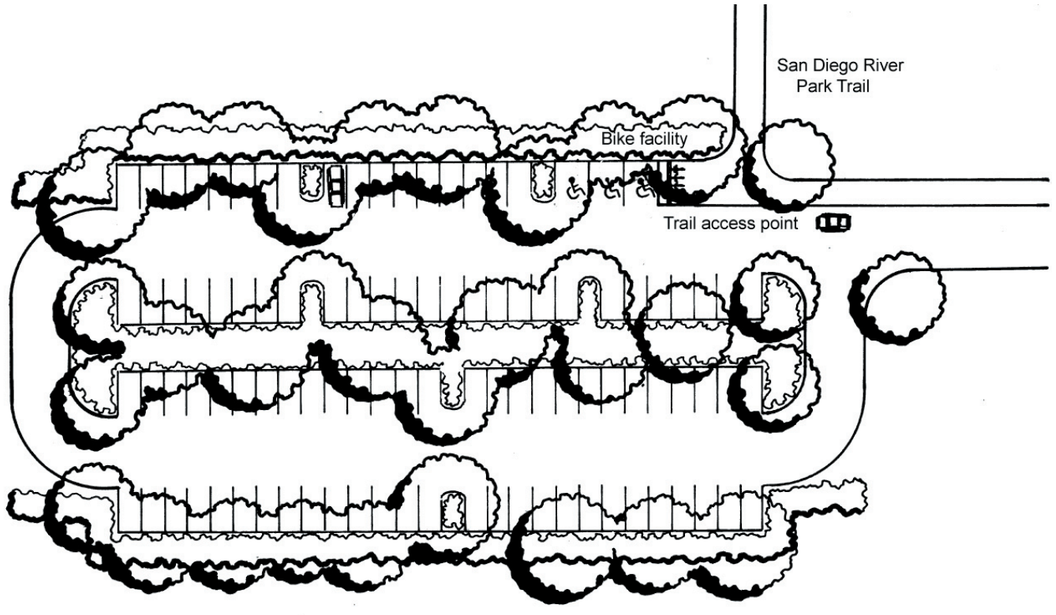
P-3. Public Transit Access

Purpose
To provide access to the river park from existing and planned public transit services.

Placement
Public transit access should be located where park users can conveniently access the river park by public transit.

Guidelines
- Provide signage and maps at public transit stops with river park access
- Utilize benches and design elements at these stops that reflect the character of the river park
- Plant native landscaping at these stops
- Showcase river-related art and projects

Associated Patterns
- Recreational fields (P-20)
- Golf courses (P-21)
- Amphitheaters (P-18)
- Playgrounds (P-16)
- Picnic areas (P-17)
- Water access (P-9)
- Access points (P-1)
- Bicycle facilities (P-2)
- Maintenance centers (P-15)
- Native landscaping (H-6)



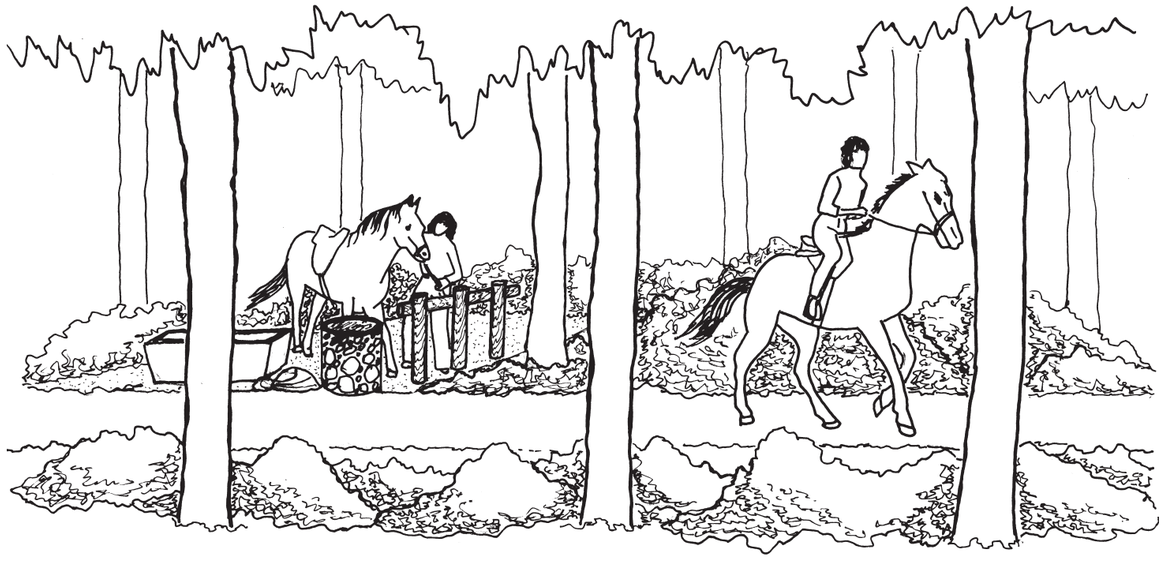
P-4. Parking

Purpose
To provide convenient access to the river park for users arriving by car while reinforcing the concept that autos are discouraged along the river park in favor of more sustainable modes of transportation such as walking, riding public transit, or riding bicycles and horses.

Placement
Parking should be located at primary activity areas including main access points, ball fields, golf courses, picnic areas, playgrounds, amphitheaters and water access, using existing automobile parking adjacent to or near river park access points. Parking should never be located within corridor, buffer or sensitive habitat areas. Pre-developed or disturbed flat areas are preferred for new parking, rather than native habitat outside of protected areas.

Guidelines
- Provide convenient drop-off and pick-up points for ADA accessibility, when parking is remotely located
- Explore the possibility of joint use access agreements and special use permits with neighboring facilities to share maintenance and costs
- Provide the minimum amount of required parking spaces to encourage car pool and public transit options
- Utilize signage to encourage alternative forms of transportation
- Provide priority spaces for energy efficient vehicles
- Utilize natural, unpaved surfaces, such as soil and gravel, to slow traffic and limit impermeable surfaces in the river park
- Utilize vegetated buffers to clean and filter any runoff from parking areas
- Provide shade with native landscaping
- Provide lighting during night time hours when park users may be returning to their vehicles

Associated Patterns
- Access points (P-1)
- Horse facilities (P-5)
- Recreational fields (P-20)
- Golf courses (P-21)
- Picnic areas (P-17)
- Playgrounds (P-16)
- Amphitheaters (P-18)
- Water access (P-9)
- Native landscaping (H-6)
- Vegetated swales (W-4)
- Infiltration zone (W-3)
- Lighting and emergency phones (P-12)
- Road crossings (P-7)



P-5. Horse Facilities

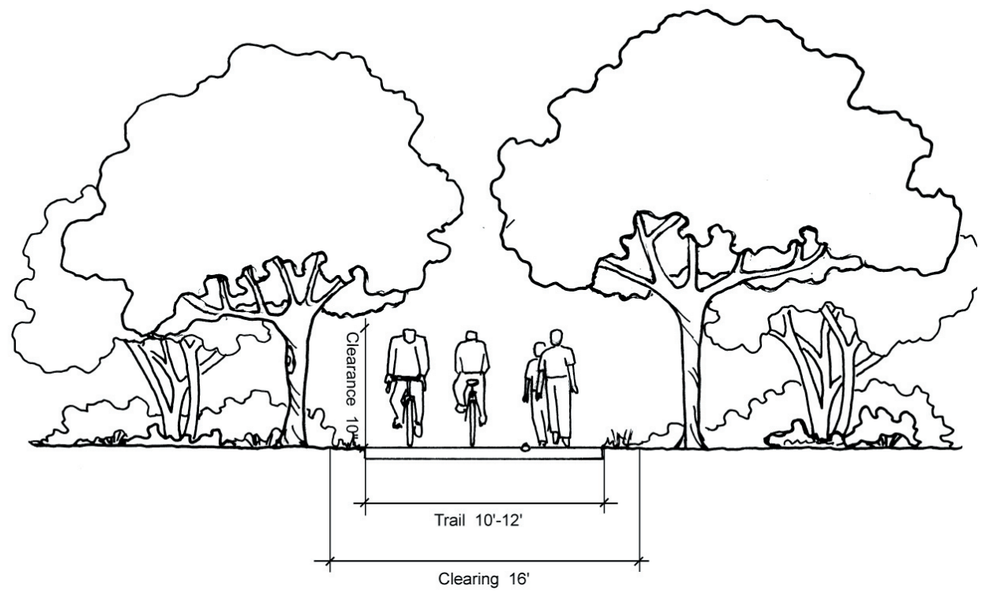
Purpose
To provide a staging area for equestrians using the river park.

Placement
Horse facilities should be provided at river park access points utilized by equestrians and concentrated in the portion of the river park east of Mission Trails Regional Park where most equestrian activity currently takes place. These facilities should not be located within bobcat corridor areas, riparian corridor areas or sensitive habitat areas.

Guidelines
- Provide hitching posts and troughs
- Develop a maintenance strategy to discourage brown-headed cowbirds from inhabiting the area which may include regular removal of horse wastes and/or cowbird trapping
- Develop an outreach program to inform equestrians of habitat issues involving horses within the river park, including brown-headed cowbirds, thus fostering bettering stewardship

Associated Patterns
- Access points (P-1)
- Parking (P-4)
- Native landscaping (H-6)
- Picnic areas (P-17)
- Benches (P-13)
- Signage (P-11)
- Lighting and emergency phones (P-12)
- Vegetated swale (W-4)

P-6a
Patterns for People



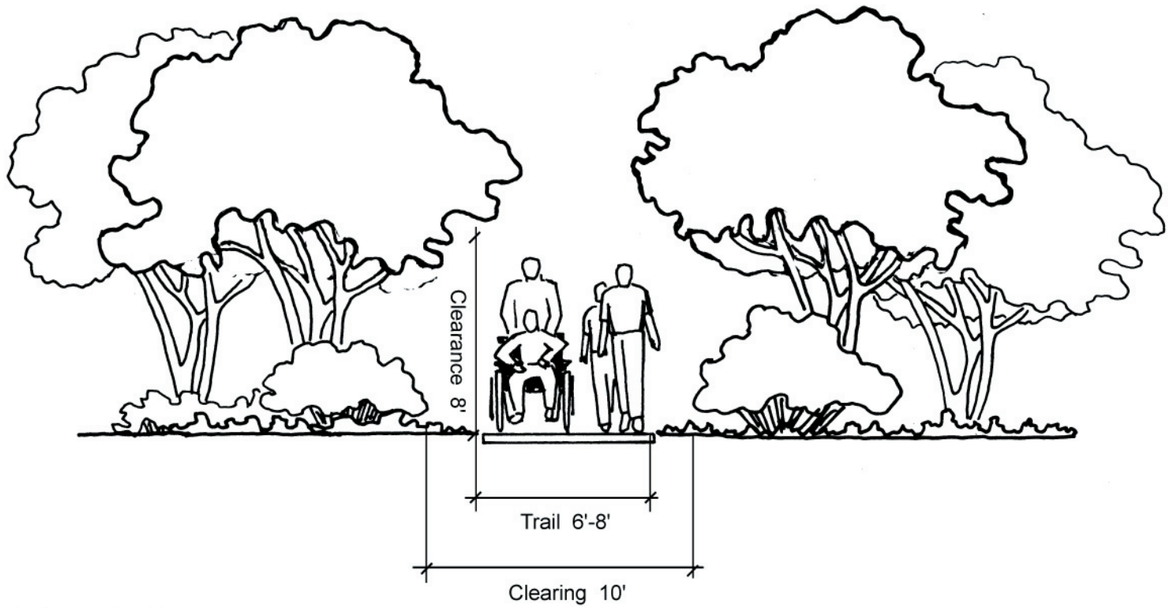
P-6a. Trail: San Diego River Park Trail

Purpose
To provide a multiuse trail to serve as the backbone of the river park, with continuous connection from El Capitan Reservoir to the Pacific Ocean. It will provide community access and regional connectivity throughout the proposed park.

Placement
The trail should be expanded upon existing trails along the river. As land becomes available or easements are acquired, the trail system will ultimately connect in a continuous trail corridor.

Guidelines
- Design to act as a buffer between the habitat and the higher impact areas along the river park
- Analyze individual sites to ensure the trail will not disturb sensitive habitat
- Choose degraded areas for placement of trails rather than disturbing healthy areas
- Consider using concrete or asphalt in areas of intensive use and use water-permeable trail surfaces where possible in areas with low anticipated use
- Determine the user types and load demands in order to define the trail width and construction materials; more heavily segments should be wider and of durable materials; asphalt and concrete are an option for the most impacted trail segments
- Treat trail edges with vegetated swales to collect and filter wastes before they reach the river
- Provide for universal access and comply with all ADA standards
- Prepare for impacts from the trail to be at least 100 feet on either side of trail
- Place barriers such as brush or boulders rather than fencing when possible to keep people on the trail
- Locate the trail so as to provide the best views whenever possible
- Avoid using sharp, angular curves and long, straight stretches of trail
- Avoid volunteer trails in riparian areas by running the trail on topographic benches and lead in at key areas rather than continuously along riparian area
- Minimize the number of stream crossings and avoid stream confluences act as nodes for wildlife
- Include an ongoing management plan that monitors trail impacts and user conflicts and allows for adjustments as necessary

Associated Patterns
- Spur trails (P-6b)
- Horse trails (P-6c)
- Road crossings (P-6)
- Directional signage (P-11b)
- Kiosks (P-10)
- Access points (P-1)
- Parking (P-4)
- Bicycle facilities (P-5)
- Vegetated swales (W-4)
- Lighting and emergency phones (P-12)
- Benches (P-13)
- View spots (P-8)
- Water access (P-9)
- Signage (P-11)
- Restrooms (P-14)
- Art (P-19)
- Native landscaping (H-6)
- Habitat restoration (H-1)



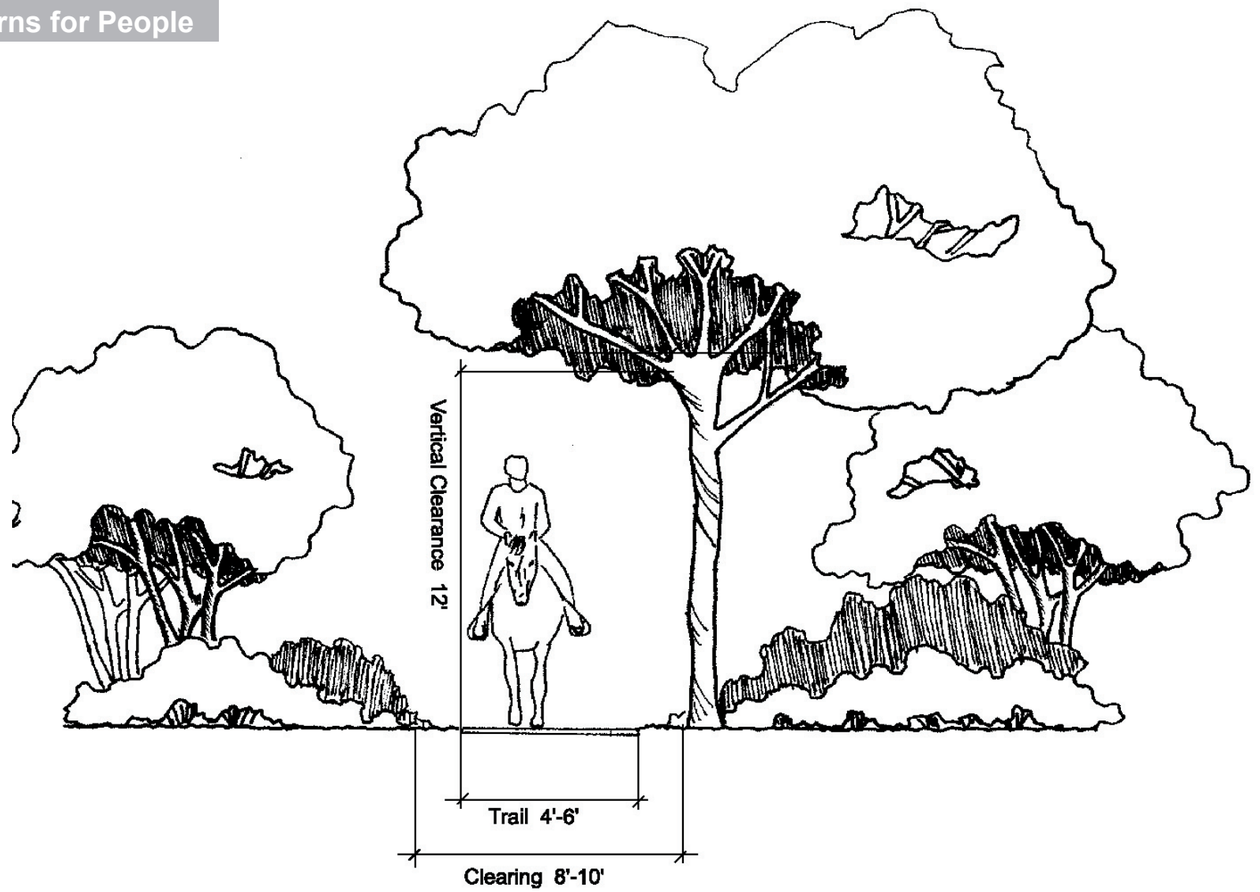
P-6b. Trail: Spur Trails

Purpose
To provide users access to unique areas of interest, such as historic sites or wildlife viewing areas. Spur trails allow low-impact, limited access to sensitive habitat or historic areas rather than routing a primary trail through or along them.

Placement
Spur trails should be located for appropriate access to sensitive habitat, historic areas or view spots.

Guidelines
- Design with narrower trail widths than San Diego River Park Trail, to help users distinguish spurs from the main trail
- Consider boardwalks in wetlands as a sensible way to allow access while decreasing damaging effects
- Limit seasonal use if impacts threaten endangered habitat or historic resources even with prevention measures
- Include an ongoing management plan that monitors trail impacts and allows for adjustments as necessary

Associated Patterns
- Signage (P-11)
- Bobcat corridor (H-3)
- Habitat corridor (H-2)
- Sensitive species areas (H-2)
- View spots (P-8)
- Water access (P-9)
- Benches (P-13)
- Picnic areas (P-17)



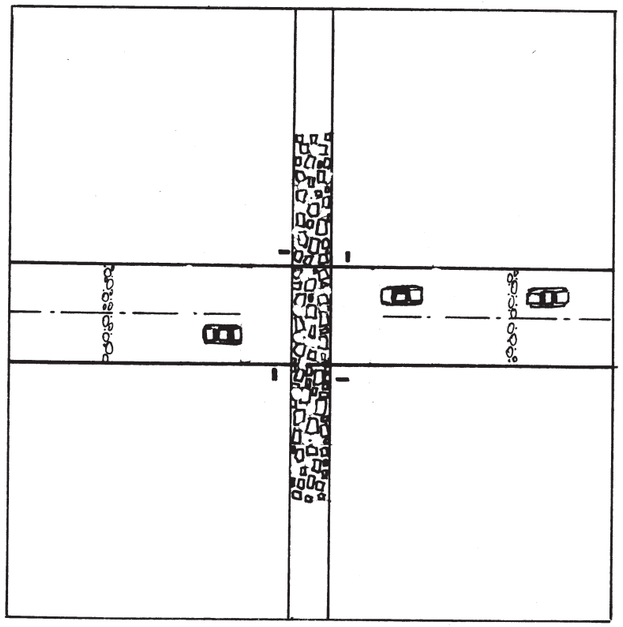
P-6c. Trail: Horse Trails

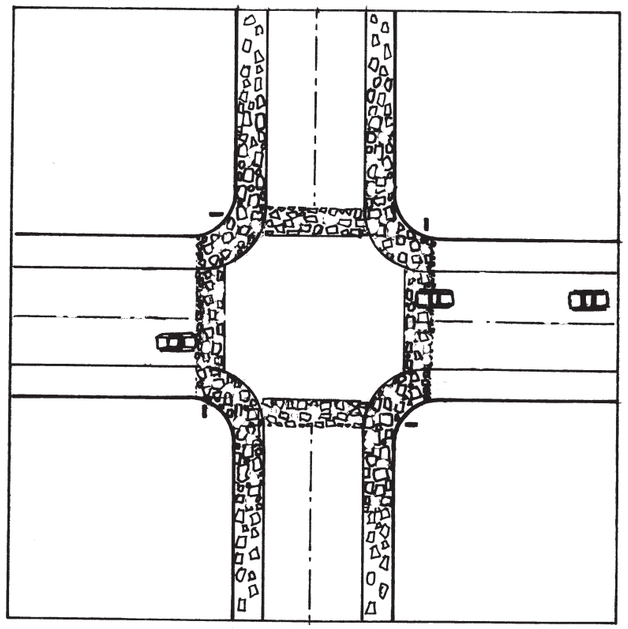
Purpose
To provide a trail dedicated for the exclusive use by horseback riders. By providing designated routes, horseback access can be organized, reducing negative impacts. Providing a narrower, dedicated trail rather than a single multiuse trail will help discourage the settlement of brown-headed cowbirds, which parasitizes the endangered least Bell's vireo.

Placement
Horse trails should be located beyond bobcat and habitat corridors or within the buffer areas of these corridors. River crossings should be limited as much as possible, and should be avoided at confluence areas. Horse trails should be kept away from sensitive habitat areas, especially those concerning least Bell's vireos, which are sensitive to the brown-headed cowbirds often accompanying horses.

Guidelines
- Choose a path with a firm, natural base to prevent erosion
- Include an ongoing management plan that monitors trail impacts and allows for adjustments as necessary
- Treat trail edges with vegetated swales to collect and filter wastes before they reach the river

Associated Patterns
- Regulatory signage (P-11d)
- Directional signage (P-11b)
- Horse facilities (P-5)
- Access points (P-1)
- Parking (P-4)
- Kiosks (P-10)
- Vegetated swales (W-4)
- Native landscaping (H-6)
- Restrooms (P-14)
- Lighting and emergency phones (P-12)
- Road crossings (P-7)





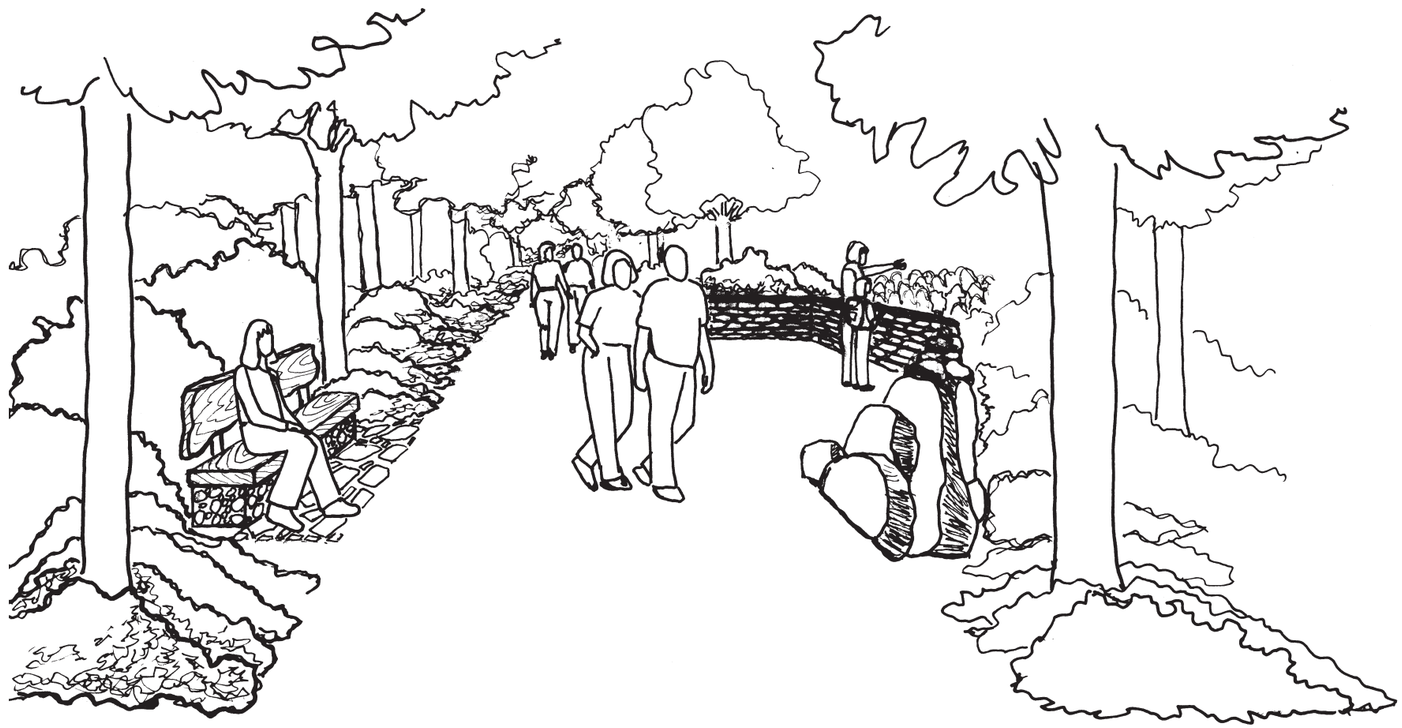
P-7. Road Crossings

Purpose
To increase the safety of park users when crossing roads within the river park.

Placement
Road crossings will be marked at all locations where pedestrians, bicycles or horses cross roads within the river park.

Guidelines
- Stop signs or signals should be located for opposing traffic at each trail / road intersection
- Crosswalks at these crossings should be clearly defined and distinctive to the river park
- Signage at these crossings should alert vehicle drivers of river park crossings
- Provide rumble strips for cross vehicular traffic to alert them to the presence of a trail crossing

Associated Patterns
- San Diego River Park Trail (P-6a)
- Lighting and emergency phones (P-12)
- Access point (P-1)
- Parking (P-4)
- Public transit access (P-3)
- Bicycle facilities (P-2)
- Horse facilities (P-5)
- Recreational fields (P-20)
- River signage (P-11a)



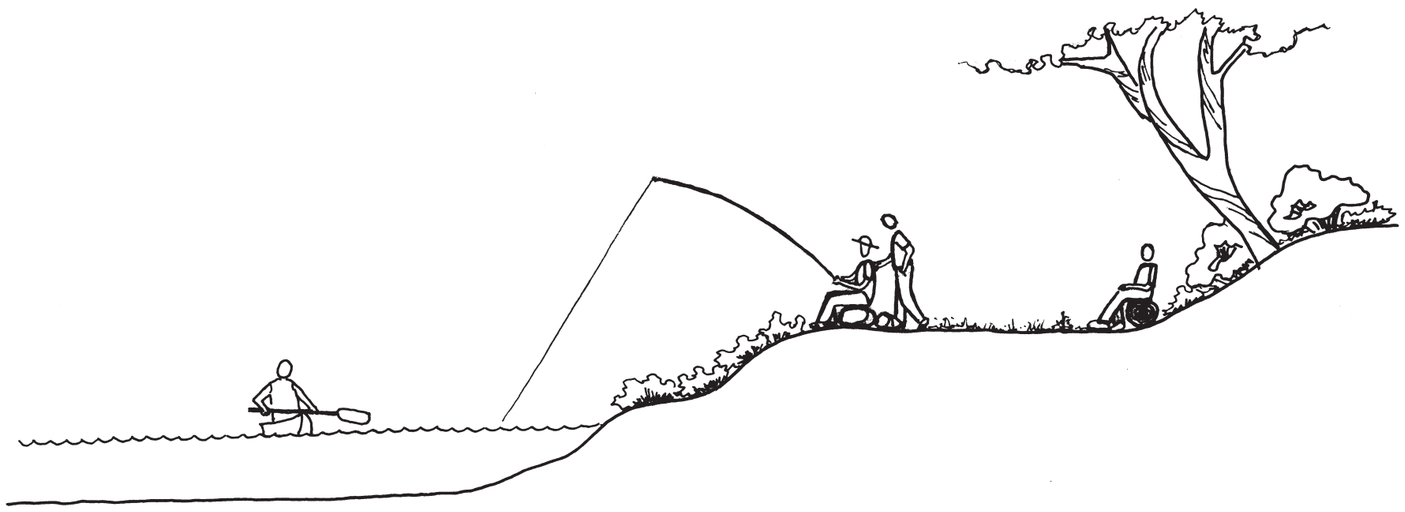
P-8. View Spots

Purpose
To provide areas for rest and viewing of scenery and wildlife.

Placement
View spots should be located at a minimum of every mile along river park paths. View spots should be set off from main paths by fifteen feet, and may be accessed by secondary paths. View spots should be located to take advantage of areas of scenic beauty, abundant wildlife, historic interest or other unique characteristics.

Guidelines
- Provide benches situated for unobstructed views
- Provide shade with native landscaping
- Interpretive signage may be provided in some areas

Associated Patterns
- Benches (P-13)
- Native landscaping (H-6)
- Interpretive signage (P-11c)
- Spur trails (P-6b)



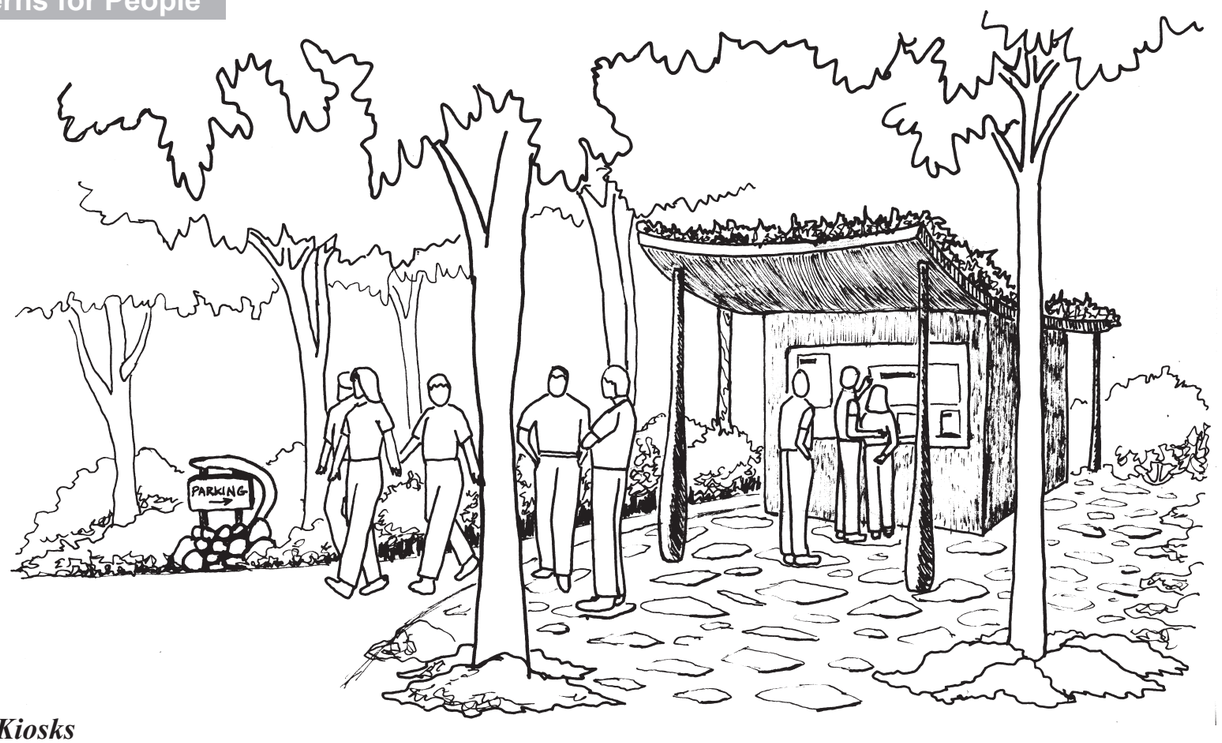
P-9. Water Access

Purpose
To provide maintained areas for safe and easy public access to the river and mining ponds for viewing, fishing and boating.

Placement
Water access should be provided on spur trails in areas with shallow slopes, equal to or less than ten to one. Water access should be located outside sensitive habitat areas and should be limited in size to reduce associated erosion problems. Currently used water access areas should be maintained when possible.

Guidelines
- Maintenance of water access areas may be necessary to prevent erosion problems, including paved boating access where erosion is great
- Provide visual access to water access areas for safety reasons

Associated Patterns
- Signage (P-11)
- View spots (P-8)
- Benches (P-13)
- Access points (P-1)
- San Diego River Park Trail (P-6a)
- Spur trails (P-6b)



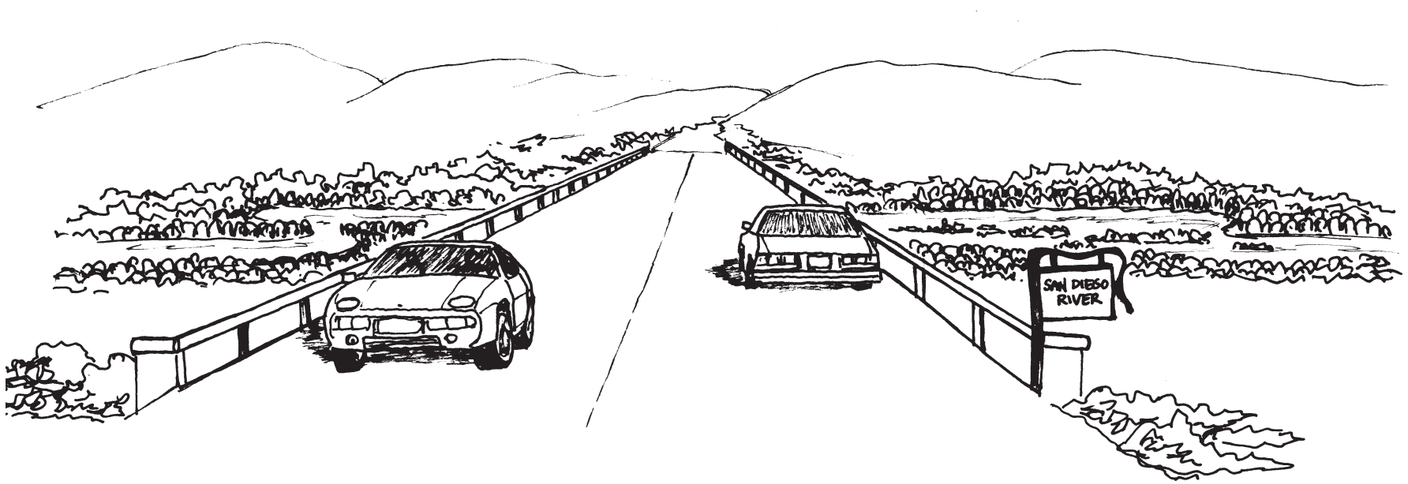
P-10. Kiosks

Purpose
To welcome users to the river park. Kiosks provide orientation and promote the value of the river park. They should give overall guidance to the opportunities along the river and group similar themes with brief descriptions. Content should include points of interest and interpretive tours within at least five miles, appropriate conduct, and relevant news.

Placement
Kiosks should be placed at access points, points of interest, maintenance centers and main nodes along the main trail. A maximum of five miles should exist between the kiosks and they can be placed in conjunction with other directional and interpretive signage.

Guidelines
- Provide a covered area where notices, signage, and other information can be displayed and protected from the weather
- Consider larger kiosks to provide refuge areas for park users in inclement weather
- Consider attaching kiosks to other facilities such as maintenance centers or restrooms to conserve resources
- Design kiosks with continuity of size so that they express a harmonious river park system
- Keep the content simple and clear for the largest audience possible
- Keep maps diagrammatic and simplified rather than detailed and confusing
- Avoid extraneous content such as interpretive information unless other signage is limited
- Use positive language to promote appropriate conduct and the benefits of obeying the rules
- Incorporate international symbols to communicate to foreign visitors

Associated Patterns
- Access points (P-1)
- San Diego River Park Trail (P-6a)
- Picnic areas (P-17)
- Playgrounds (P-16)
- Recreational fields (P-20)
- Amphitheaters (P-18)
- Maintenance centers (P-15)
- Public transit access (P-3)
- Parking (P-4)
- Bicycle facilities (P-2)
- Horse facilities (P-5)
- Benches (P-13)



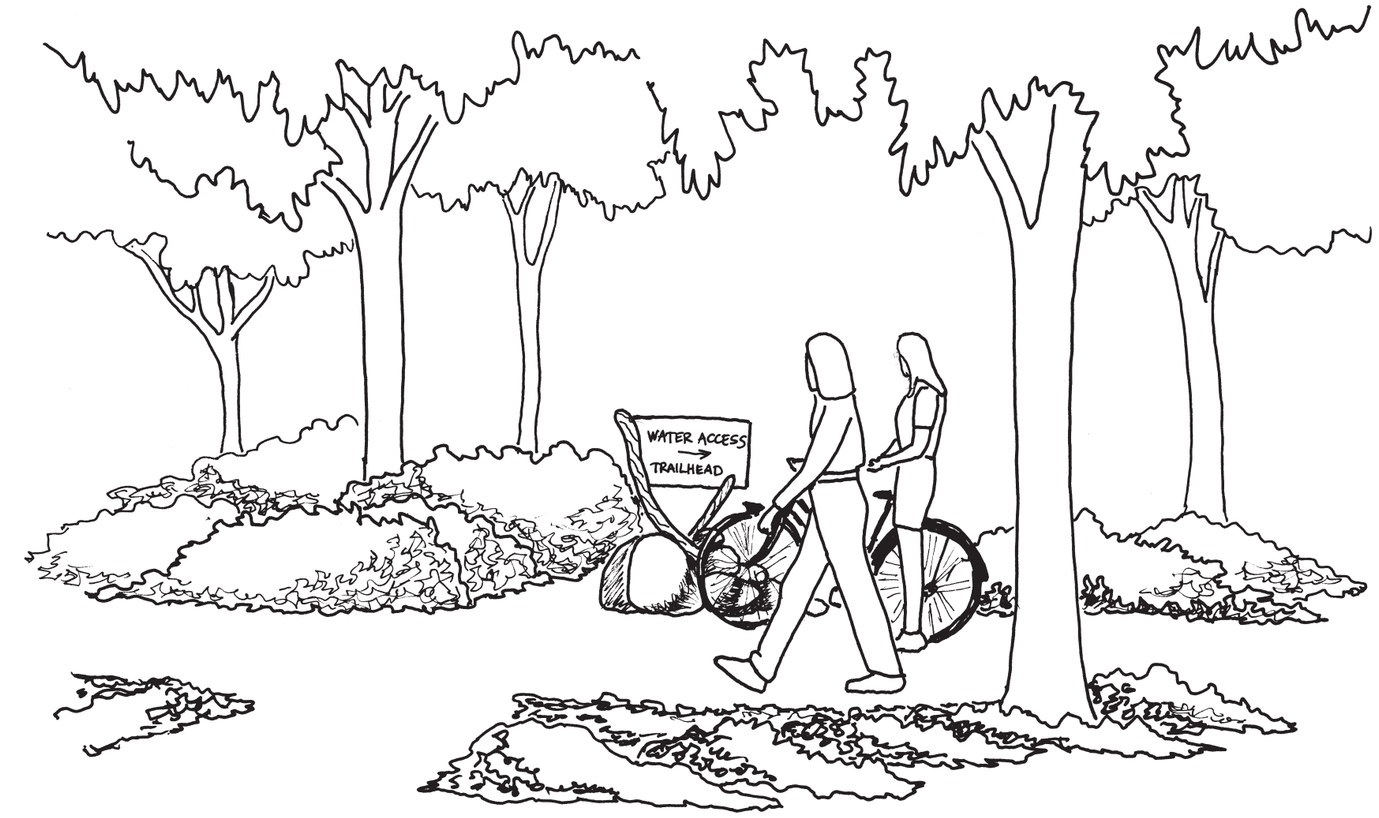
P-11a. Signage: River Signage

Purpose
To promote the identity of the river along all transit corridors adjacent and over the river.

Placement
River signage should be located along the entire length of the river at all river crossings and along segments where the river is visible from adjacent roadways.

Guidelines
- Design signage to be consistent in size, location and information
- Use a distinctive logo that will be repeated on signs throughout the river park
- Design with universal standards

Associated Patterns
- Road crossings (P-7)



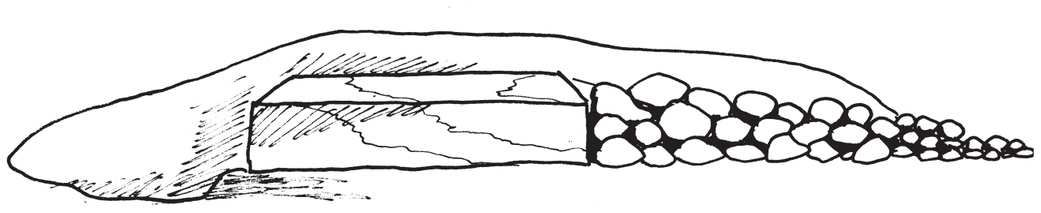
P-11b. Signage: Directional Signage

Purpose
To give users of the river park information on length of trail, difficulty and approximate time to various destinations.

Placement
At access points, intersections with roads and other trails

Guidelines
- Design signage to be consistent in size, location and information
- Use graphic symbols and brief descriptions

Associated Patterns
- San Diego River Park Trail (P-6a)
- Horse trails (P-6c)
- Spur trails (P-6b)
- Access points (P-1)
- Road crossings (P-7)



P-11c. Signage: Interpretive Signage

Purpose

Provides educational activities to provoke thought and curiosity about unique natural and cultural features along the river park. Interpretive signage can be either self-guided or used to supplement a conducted tour. Interpretive signage should not be located within the one hundred year flood plain where it can be easily damaged.

Placement

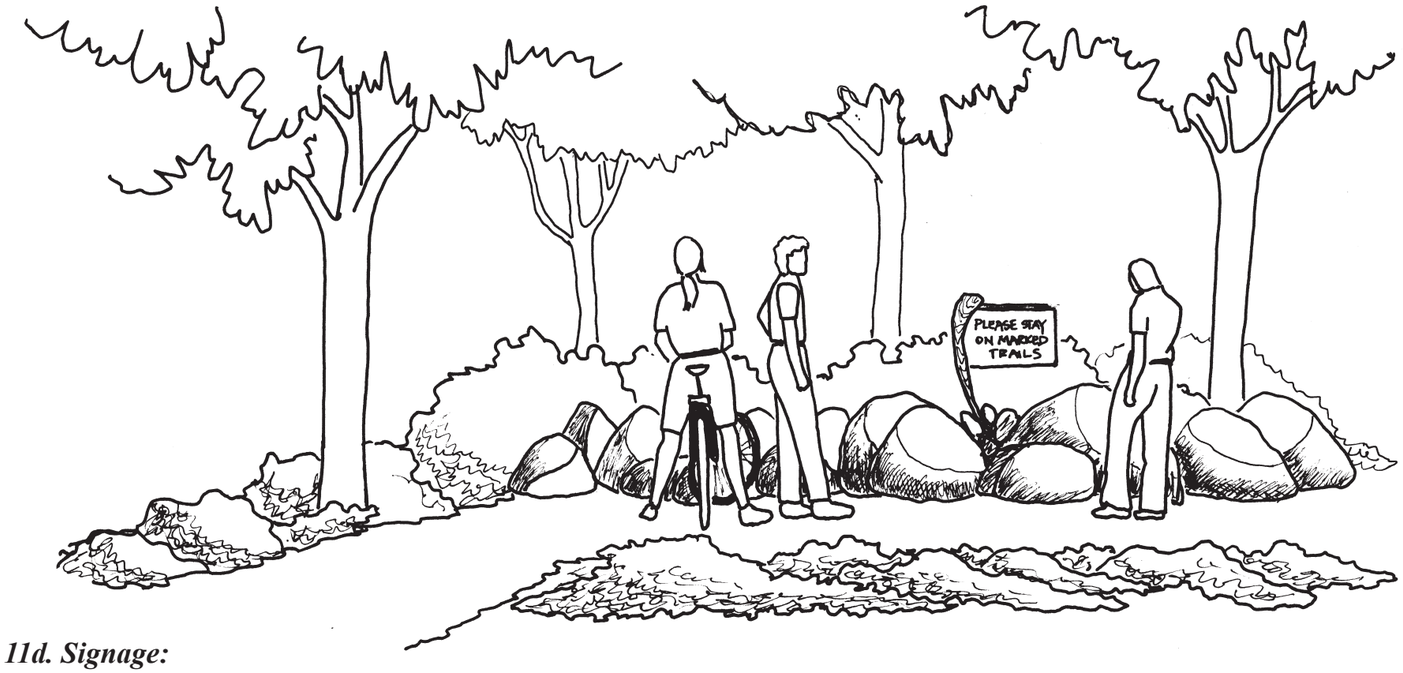
Interpretive tours are more effective than solo interpretive signage. They should be at unique areas of interest in a loop, figure eight or linear arrangement depending on site context. Spur trails work well for interpretive tours because pedestrians are more likely to slow down and observe the signs (Ham, 1992).

Guidelines

- Develop distinctive themes with five or fewer ideas/categories per theme; themes are successful at communicating larger patterns in the landscape because people tend remember themes but forget facts
- Provide a sign at the trailhead that introduces the theme of the tour and highlights the most interesting stops, and have the first stop visible from the starting point
- Design the tour to be no longer than 0.5 miles and 30-40 minutes in length
- Provide an average of 15 stops per half mile tour
- Attempt to have most stops during first half segment of the trail
- Add curves and visual barriers between signs for a sense of mystery
- Setback the signs from path of travel
- Design graphics so they are attractive and easy to comprehend
- Encourage users to focus attention on the interpreted feature, remembering to have an introduction, body and conclusion to the tour in order to stimulate interest and reinforce the overall theme

Associated Patterns

- San Diego River Park Trail (P-6a)
- Spur trails (P-6b)
- Access points (P-1)
- View spots (P-8)
- Phytoremediation (W-8)
- Infiltration zones (W-3)
- Vegetated swales (W-4)
- Detention basins (W-5)
- Retention basins/wetlands (W-6)
- Stormwater treatment areas (W-7)
- Maintenance centers (P-15)
- Kiosks (P-10)
- Benches (P-13)
- Bobcat corridor (H-3)
- Habitat corridor (H-2)
- Sensitive species area (H-5)



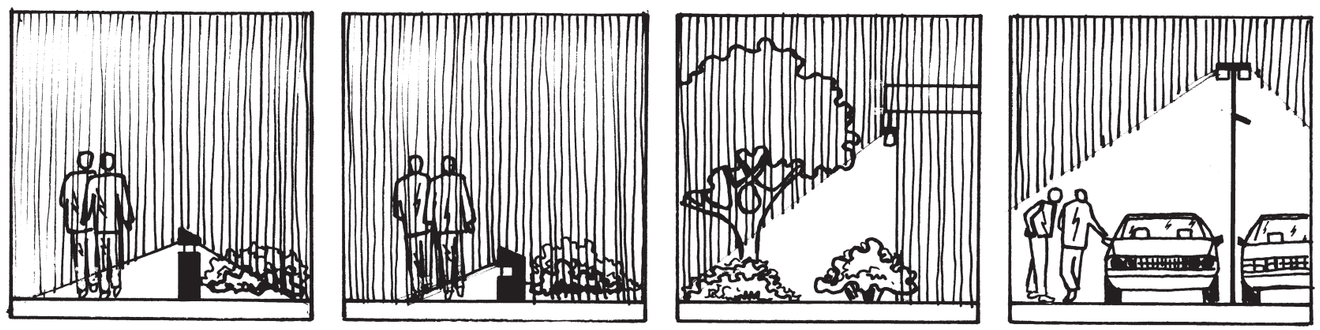
11d. Signage: Regulatory Signage

Purpose
To display laws and regulations pertaining to the river park.

Placement
At access points and areas where messages need reinforcement.

Guidelines
- Design signage to be consistent in size, location and information
- Regulatory signage should not conflict with other components of the signage system
- Provide reasoning for the rules with firm, positive language, as well as the benefits to the user and/or the river park for obeying them

Associated Patterns
- San Diego River Park Trail (P-6a)
- Horse trails (P-6c)
- Spur trails (P-6b)
- Access points (P-1)
- Maintenance centers (P-15)
- Bobcat corridor (H-3)
- Habitat corridor (H-2)
- Sensitive species area (H-5)
- Recreational fields (P-20)
- Golf courses (P-21)
- Playgrounds (P-16)
- Horse facilities (P-5)
- Parking (P-4)
- Picnic areas (P-17)
- Water access (P-9)



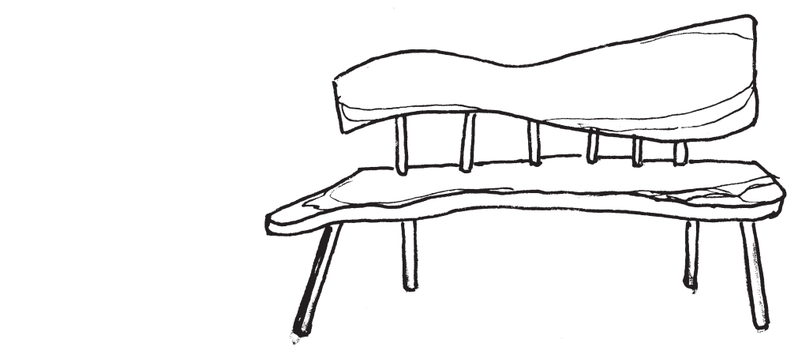
P-12. Lighting and Emergency Phones

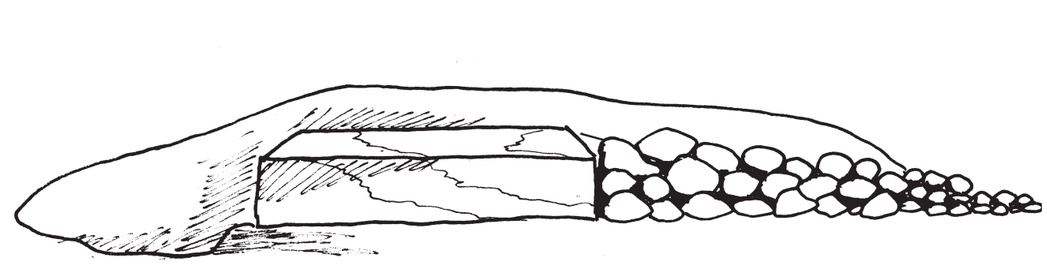
Purpose
To increase safety and comfort within the river park.

Placement
Appropriate lighting should be placed in the more urban portions of the river park, such as the Estuary, Mission Valley and Santee, and where safety issues are a concern. Parking areas should be lit at night and during early evening when river park users may be returning to their vehicles. Access points, public transit access, bicycle facilities and restrooms can also be lit. Ball fields and golf courses can be lit for longer playing times. Lighting should be limited and at low height when placed within habitat buffer areas. Lighting should not be used in corridor or sensitive species areas. Emergency phones should be placed at points farther than two miles from other facilities. Phones should be located at access points for easy access and maintenance.

Guidelines
- Utilize solar lighting to conserve energy and save on infrastructure costs
- Use lights at lower heights in habitat buffer areas
- Protect corridor or sensitive species areas from nighttime lighting

Associated Patterns
- San Diego River Park Trail (P-6a)
- Parking (P-4)
- Access points (P-1)
- Public transit access (P-3)
- Bicycle facilities (P-2)
- Restrooms (P-14)
- Recreational fields (P-20)
- Golf courses (P-21)





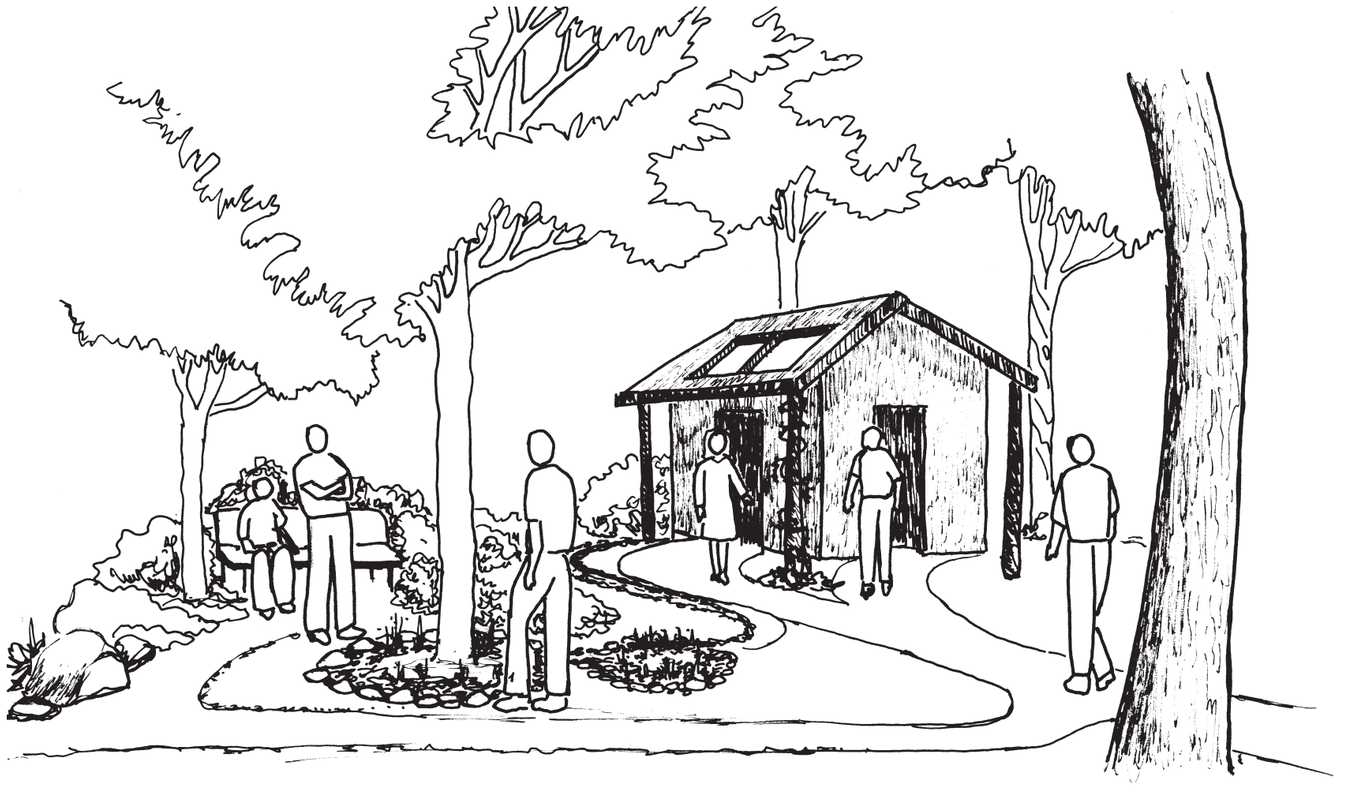
P-13. Benches

Purpose
To provide comfortable and convenient seating complementing the character and spirit of the river park.

Placement
Benches should be provided throughout the river park, at a minimum of one for every half mile of trail in urban areas. Benches should be included at access points, maintenance centers, parking areas, view spots, along trails, and in other areas. When along trails, benches should be placed at least three feet off the main trail.

Guidelines
- Accommodate seating for four to six people
- Provide benches in sunny and shady locations, though shady benches are usually preferred
- Placement should maximize scenic viewing opportunities
- Provide benches in clusters to accommodate multiple sets of users
- Design should reflect the character and spirit of the river park
- Provide benches with arm rests to aid the elderly rise from seating

Associated Patterns
- San Diego River Park Trail (P-6a)
- Horse trails (P-6c)
- Spur trails (P-6b)
- Access points (P-1)
- Maintenance centers (P-15)
- Playgrounds (P-16)
- Parking (P-4)
- View spots (P-8)
- Art (P-19)
- Native Landscaping (H-6)



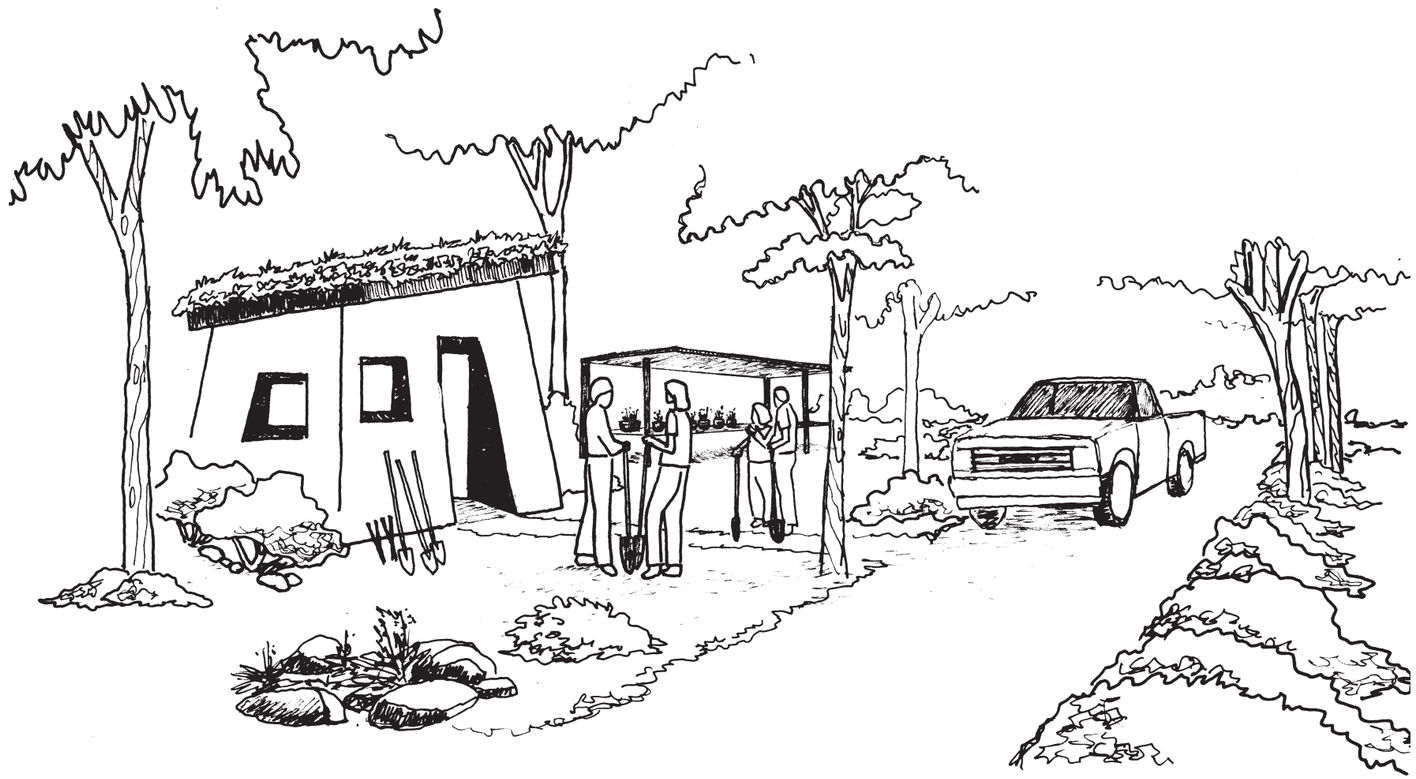
P-14. Restrooms

Purpose
To provide river park users with sanitary facilities.

Placement
Restrooms should be located at gathering areas such as picnic areas, ball fields, playgrounds, and where alternative facilities are not easily accessible. Restrooms should be located outside of the one hundred year flood plain.

Guidelines
- Utilize onsite treatment of greywater, providing educational opportunities and irrigation for native landscaping
- Utilize composting or low flow toilets
- Provide skylights or translucent windows to reduce energy needs
- Develop a regular maintenance program, which may include locking the facilities at night
- Restrooms should be ADA accessible

Associated Patterns
- Picnic areas (P-17)
- Recreational fields (P-20)
- Golf courses (P-21)
- Playgrounds (P-16)
- Kiosks (P-10)
- Native Landscaping (H-6)



P-15. Maintenance Centers

Purpose
To provide areas for the storage of supplies and equipment used in the maintenance of the river park. To provide nursery locations for the propagation of local native plants for use in the river park. To demonstrate sustainable building practices. To encourage volunteer support of maintenance activities.

Placement
Several maintenance centers should be located within the river park to provide for maintenance needs. Locations should be easily accessible, centrally located within the area of service, outside of sensitive habitat and buffer zones, and outside of the one hundred year flood plain. Ideally, the sites will be within disturbed areas with easy access to utilities and water and adjacent to restoration or educational areas.

Guidelines
- Provide a locking sustainable construction building, straw bale with a greenroof, for the storage of tools and equipment
- Provide an adjacent propagation area with access to water and electricity
- Provide benches and tables for outdoor gathering

Associated Patterns
- Parking (P-4)
- Public transit access (P-3)
- Bicycle facilities (P-2)
- Kiosks (P-10)
- Benches (P-13)
- Native Landscaping (H-6)
- Signage (P-11)

P-16. Playgrounds

Purpose
To provide active play areas for children within the river park. To create play areas that are appropriate to the river park and reflect the character and nature of the San Diego River.

Placement
Playgrounds should be located where there is community need for active play areas for children. Locations should be flat, easily accessible, visually accessible to surrounding trails, roads or structures, and clustered with other activity areas such as ball fields, amphitheater, and picnic areas. Playgrounds should be safely separated from vehicular traffic, water access, and stray balls from ball fields.

Guidelines
- Construct play areas of materials that reflect the character of the reach and sense of place within the river park, such as wood, stone, sand and water
- Playgrounds should be universally accessible, following all guidelines for ADA accessibility, with efforts made to seamlessly incorporate universal activities
- Provide a variety of activities for a range of young ages within the playground
- Provide comfortable, shaded benches and view spots for parents

Associated Patterns
- Benches (P-13)
- View spots (P-8)
- Native landscaping (H-6)
- Restrooms (P-14)
- Parking (P-4)
- Public transit access (P-3)
- Bicycle facilities (P-2)
- Picnic areas (P-17)
- Recreational fields (P-20)
- Amphitheater (P-18)

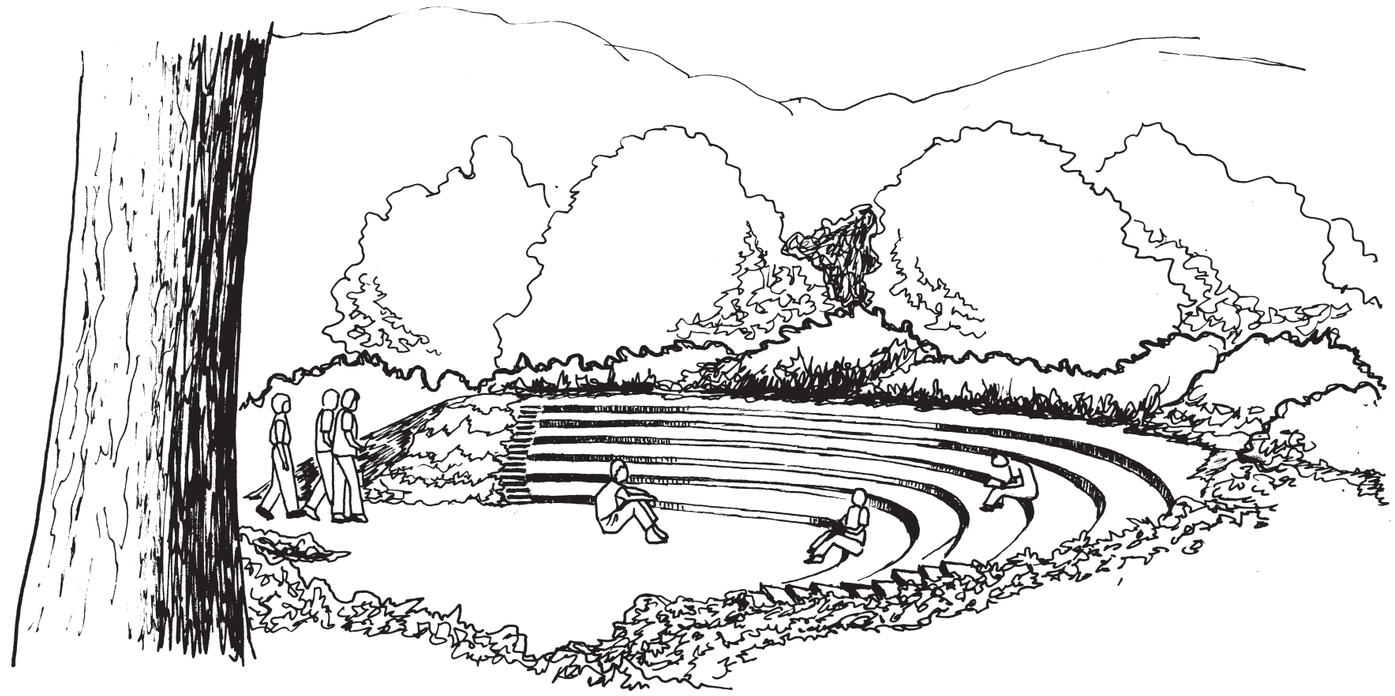
P-17. Picnic Areas

Purpose
To provide appropriate and comfortable spaces for picnicking and gathering within the river park.

Placement
Picnic areas should be located near river park access points with associated access to public transit, parking, bicycle facilities or horse facilities where appropriate. Locations off main trails connected by a smaller access trail are ideal. Picnic areas should be clustered with other activity areas such as ball fields, playgrounds, amphitheaters, maintenance centers or kiosks.

Guidelines
- Provide universal access and follow all applicable ADA guidelines
- Provide pleasing views of the river or mountains where possible
- Provide ample shade for at least a portion of the picnic area
- Provide vehicle access for maintenance
- Provide trash and recycling receptacles with lids or other mechanisms to prevent wildlife scavenging
- Provide signage to encourage good stewardship activities such as proper clean up and not feeding wildlife

Associated Patterns
- Native landscaping (H-6)
- Access points (P-1)
- Restrooms (P-14)
- Parking (P-4)
- Bicycle facilities (P-2)
- Horse facilities (P-5)
- Public transit access (P-3)
- Recreational fields (P-20)
- Playgrounds (P-16)
- Amphitheaters (P-18)
- Maintenance centers (P-15)
- Kiosks (P-10)
- Signage (P-11)
- Art (P-19)



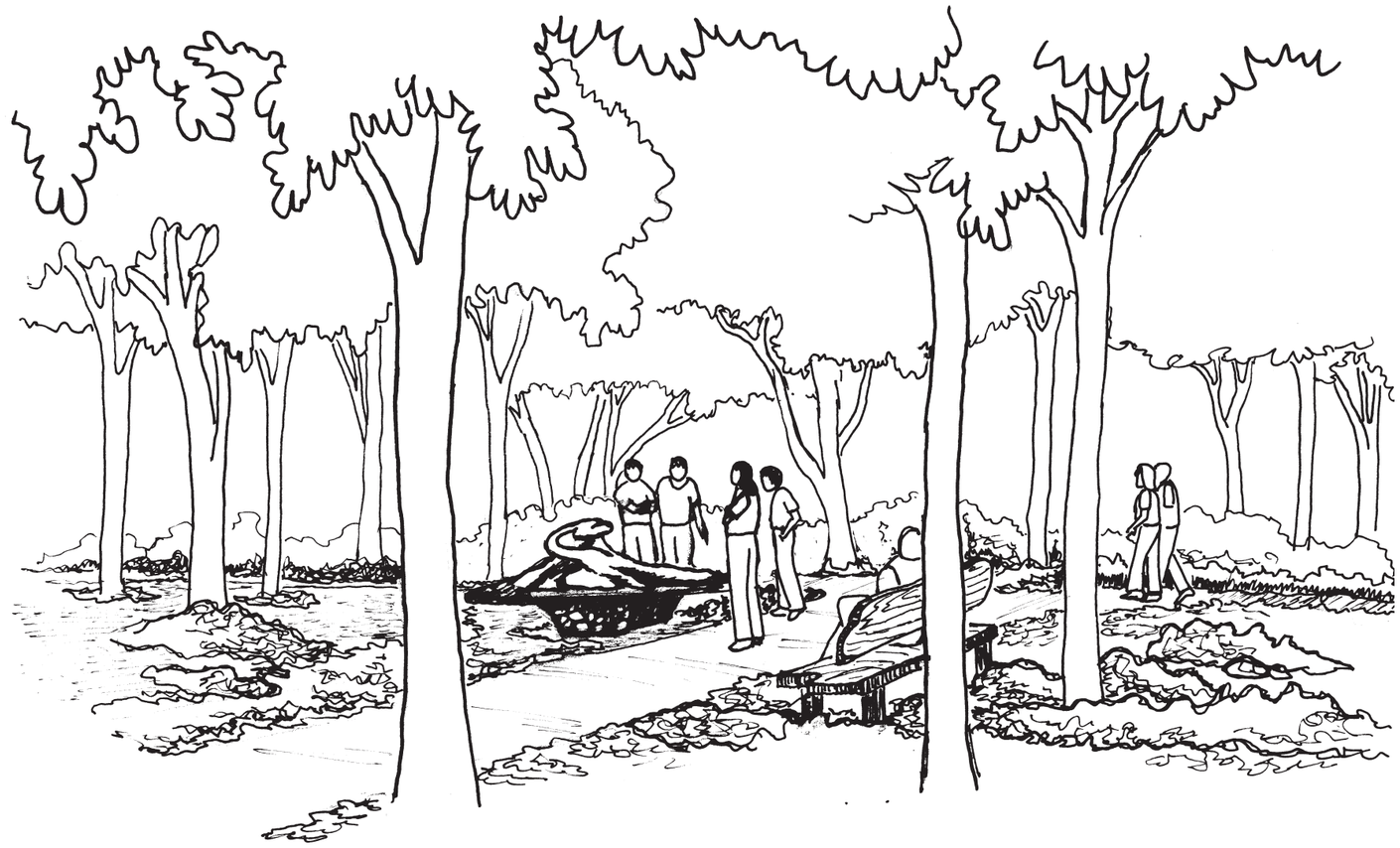
P-18. Amphitheaters

Purpose
To provide gathering spaces and opportunities for outdoor education, meetings, plays or non-amplified music within the river park.

Placement
Additional opportunities for amphitheaters in the river park should be located near river park access points in areas with north or east facing aspects and suitable shallow slopes, and where gatherings are expected such as near cultural sites or schools.

Guidelines
- Provide terraced informal structure for intimate and flexible seating
- Construct seating facing north or east for audience comfort
- Provide shade for at least a portion of the seating area
- Scale to minimize impact on natural aesthetics of river park and use land contours to form seating area
- Design to take advantage of outdoor environment
- ADA accessibility should be provided

Associated Patterns
- Native landscaping (H-6)
- Access points (P-1)
- Parking (P-4)
- Public transit access (P-3)
- Bicycle facilities (P-2)
- Picnic areas (P-17)
- Art (P-19)



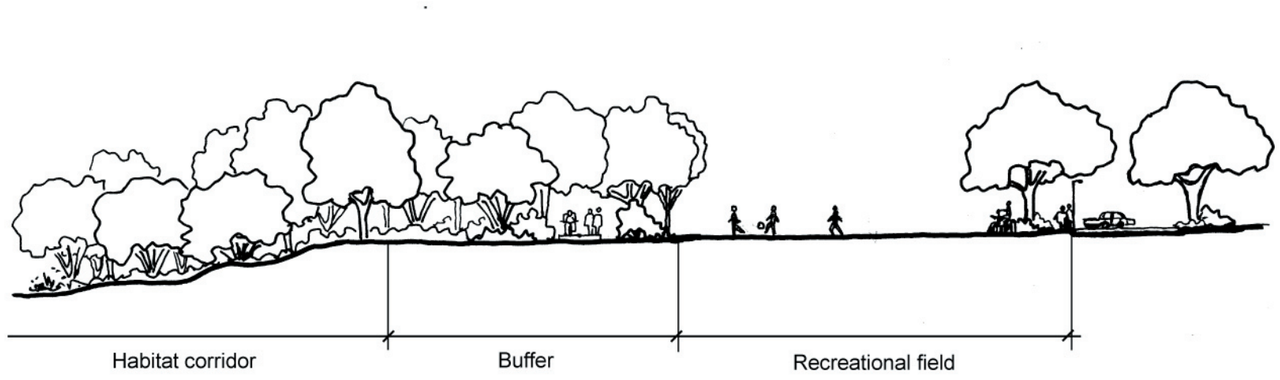
P-19. Art

Purpose
Art in the river park can reinforce the cultural, historic and native qualities of the San Diego River. It can provide additional interest to the park and encourage people to visit regularly to see work and performances by local artists.

Placement
Art can be located at almost any location in the river park, but areas with high numbers of visitors are ideal. Some possible locations include public transit access, access points, amphitheaters and playgrounds.

Guidelines
- Art in the river park should reflect the quality, character or nature of the river, region or people in some way
- Local artists in the community should be featured
- Encourage the display of art by children and "non-artists"

Associated Patterns
- Benches (P-13)
- Public transit access (P-3)
- Access points (P-1)
- Amphitheaters (P-18)
- Playgrounds (P-16)
- Picnic areas (P-17)



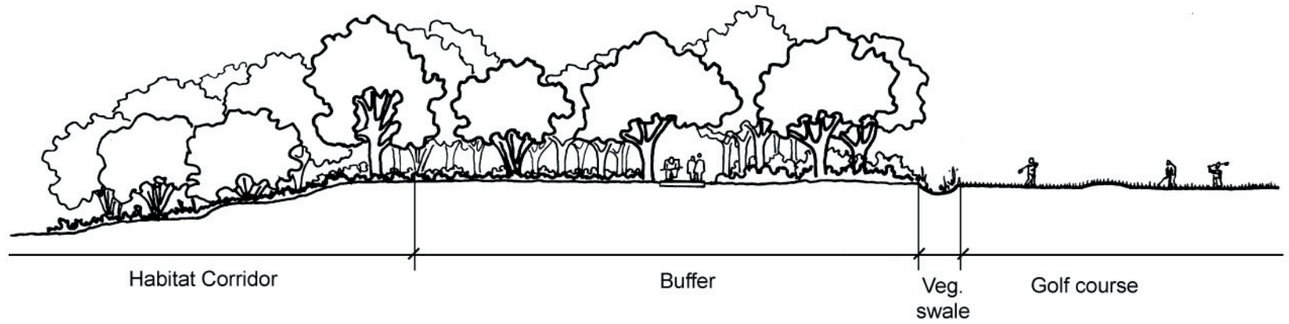
P-20. Recreational Fields

Purpose
To provide for the active recreational needs of the community.

Placement
Ball fields should be located outside of corridor, buffer and sensitive habitat areas. Pre-developed or disturbed flat areas are preferable to native habitat areas outside protected areas. Ball fields should be located near access points, parking, public transit access and bicycle facilities. Ball fields should be located in areas where local residents desire them.

Guidelines
- Manage irrigation to prevent excess runoff
- Use organic fertilizers and limit the use of pesticides
- Provide lighting for night time games where desired
- Consider use of artificial turf to minimize water, pesticide and fertilizer use

Associated Patterns
- Parking (P-4)
- Lighting and emergency phones (P-12)
- Access points (P-1)
- Kiosks (P-10)
- Public transit access (P-3)
- Bicycle facilities (P-2)
- Picnic areas (P-17)
- Playgrounds (P-16)
- Amphitheaters (P-18)
- Native landscaping (H-6)
- Restrooms (P-14)



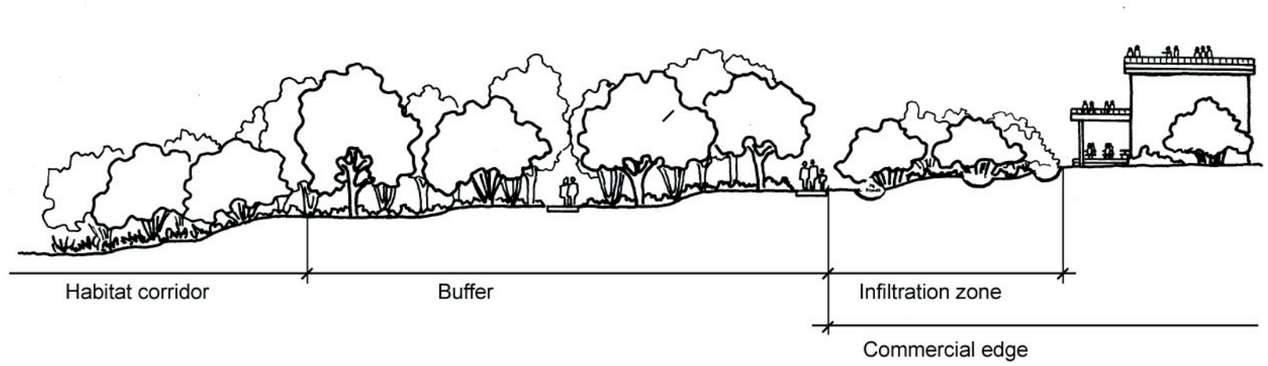
P-21. Golf Courses

Purpose
To provide golfing facilities.

Placement
Golf courses are currently located in many areas of the river park. Due to high impacts on water and habitat, additional golf courses are not recommended within the river park. Existing golf courses should be coordinated with public access points, parking, mass transit access and bicycle facilities.

Guidelines
- Manage irrigation to prevent excess runoff
- Manage fertilizers, and pesticides if necessary, to prevent contamination of the river or nearby habitat
- Maintain corridor, buffer and sensitive species areas within golf courses
- Utilize native landscaping
- Trail access through golf course areas should have clear signage alerting park users to associated dangers
- Provide alternative trail routes around of golf course areas
- Create wildlife habitat within golf courses where possible

Associated Patterns
- Parking (P-4)
- Lighting and emergency phones (P-12)
- Access points (P-1)
- Public transit access (P-3)
- Trails (P-6)
- Native landscaping (H-6)
- Habitat restoration (H-1)



P-22. Commercial Edges

Purpose
To generate river focused activity along the edges of the river park.

Placement
Commercial edges should be located only in the most urban portions of the river park. They should lie well outside corridor, buffer and sensitive species areas. Commercial edges should be located near parking, public transit access, bike facilities, and high activity areas such as ball fields, golf courses and playgrounds, but outside of the one hundred year flood plain.

Guidelines
- Businesses should have entrances facing and recognizing the river
- Encourage participation of businesses that are river-related or cater to park users such as cafes, hotels, restaurants or small shops
- Encourage river-friendly building practices such as green roofs, increased permeable surfaces, inclusion of detention or retention basins and vegetated swales to reduce river impacts

Associated Patterns
- Road crossings (P-7)
- Parking (P-4)
- Public transit access (P-3)
- Bicycle facilities (P-2)
- Vegetated swales (W-4)
- Detention basins (W-5)
- Retention basins/wetland (W-6)
- Infiltration zones (W-3)
- Native landscaping (H-6)
- Recreational fields (P-20)
- Golf courses (P-21)
- Playgrounds (P-16)

RECOMMENDATIONS

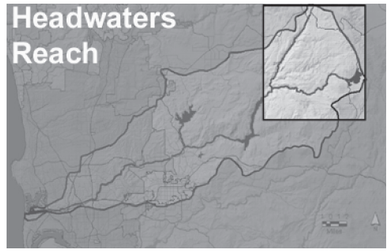
While the San Diego River Park will serve to unify the river as a whole, each reach of the river park maintains distinct resources and character. Recommendations for each reach have been generated in three categories:

- Design
- Patterns
- Character

Design Recommendations

Process

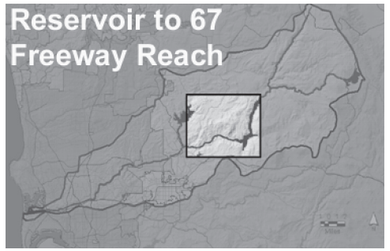
Design Recommendations are generated for each reach of the river park based on an analysis of the opportunities available in each reach. Opportunities, as previously described, are developed from the synthesis of project goals, context and community involvement. Design Recommendations provide guidance regarding the possibilities of design opportunities for each reach. Their specific application in site design is described in detail in Chapter Five, Site Design.



Headwaters

The historic resources, natural river environment, high quality of habitat, and recreational and educational opportunities make connections to this portion of the watershed a high priority.

1. Protect historic resources by coordinating with the local Kumeyaay Indian Reservations to promote their cultural heritage linkages with the San Diego River, with the National Forest and State Park Services to promote cultural identity with the river, and with the town of Julian State Historic Landmark
2. Enhance the preservation and management of historic resources including Kumeyaay village sites of Sinyau-Tehwir, Witlimak, Kosmit, Anyaha and Atlkwanen as well as existing agricultural heritage.
3. Preserve the free-flowing character of the river and its tributaries to prevent further alteration of sediment transport processes.
4. Prevent increased runoff and decreased groundwater infiltration by limiting impermeable surfaces and facilitating public education about the impacts of runoff
5. Prevent deterioration of water qual ity by maintaining riparian habitat, promoting good management practices for agriculture and recreational facilities, utilizing vegetated filters and stormwater treatment areas for runoff flowing into the river or tributaries, and educating the public about how their actions affect water quality affect downstream
6. Enhance existing native habitat by encouraging habitat protection, including Wilderness and Wild and Scenic River Designation for the river, promoting native habitat restoration where necessary, and providing management strategies to counteract the effects of fire suppression
7. Maintain connectivity for wildlife into the San Diego River corridor
8. Promote appropriate integration of recreation and wildlife by managing for recreational users and designing to prevent impacts to sensitive species
9. Educate the public about the plants and animals of the region and potential impacts on them
10. Encourage local schools, colleges and universities to utilize the area as a natural outdoor laboratory
11. Coordinate with Inaja Memorial Picnic Ground and National Recreational Trail
12. Create opportunities for connections to existing trails in Cleveland National Forest and Cuyamaca Rancho State Park and the Trans County Trail
13. Provide additional opportunities for appropriate recreational facilities and trails as the population grows
14. Provide signage at all river crossings



Reservoir to 67 Freeway
At the western end of the river park, this reach, predominatly agricultural, maintains much of its natural character. Recommendations, therefore, focus on preserving this natural character.

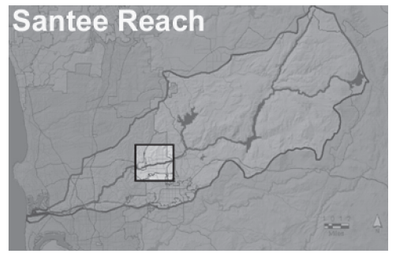
1. Enhance preservation and management of the agricultural heritage of the area through coordination with local farmers
2. Facilitate public education about the history of the river, revealing the changes to the river valley caused by the El Capitan Reservoir and Dam
3. Preserve the free-flowing seasonal character of the river and its tributaries to prevent further alteration of sediment transport processes
4. Prevent increased runoff and decreased groundwater infiltration by limiting impermeable surfaces and facilitating public education about the impacts of runoff
5. Prevent further development within the floodplain
6. Develop a program for the removal of non-native flora within the river that can worsen the impacts of flooding
7. Prevent deterioration of water quality by maintaining riparian habitat, promoting good management practices for agriculture, recreational facilities and golf courses, utilizing vegetated filters and stormwater treatment areas for runoff flowing into the river or tributaries from developed areas, and educating the public about how their actions affect water quality downstream
8. Monitor groundwater quality and implement improvement strategies such as phytoremediation if necessary
9. Enhance the existing native habitat by encouraging habitat protection, promoting native habitat restoration, and providing management strategies to counter act the effects of fire and flood suppression
10. Maintain habitat connectivity for wildlife along the San Diego River corridor
11. Promote appropriate integration of recreation and wildlife by managing for recreational users and designing to prevent impacts to sensitive species
12. Provide interpretive signage about the natural history of the river.
13. Take advantage of educational opportunities to educate the public about the plants and animals of the region and their potential impacts on them. Encourage local schools, colleges and universities to utilize the area as a natural outdoor laboratory
14. Coordinate connections with El Capitan Reservoir, El Monte Park, Lake Jennings and El Monte Golf Course, and enhance these recreational areas to better reflect their river side locations
15. Create a continuous river park trail that connects with trails in adjoining reaches
16. Create opportunities for connections to the existing local trails and the Trans-County Trail
17. Provide additional opportunities for recreational areas, trails, and public access, and preserve open space
18. Provide signage at all river crossings and where river park trails cross streets and roads

Lakeside
Lakeside is a rapidly changing area as mining and agriculture are being replaced by suburban development. Recommendations for the river park focus on preservation of cultural heritage and improvement of recreational access, with additional recommendations regarding water resources and habitat.

1. Enhance the preservation and management of the agriculture and mining heritage of the area by working with the local community and designing to reflect the cultural influences of the area
2. Facilitate public education about the history of the river, revealing the changes to the river valley caused by sand mining and channelization
3. Restore mining pits in the river to their natural grades to improve sediment transport processes
4. Prevent increased runoff and decreased groundwater infiltration by maintaining and promoting the use of permeable surfaces and facilitating public education about the impacts of runoff
5. Prevent further development within the floodplain
6. Develop a program for the removal of nonnative vegetation in the river that can worsen the impacts of flooding
7. Prevent deterioration of water quality by maintaining riparian habitat, promoting good management prac-

tices for agriculture, recreational facilities and golf courses, utilizing vegetated filters and stormwater treatment areas for runoff flowing into the river or tributaries from developed areas, and educating the public about how their actions affect water quality downstream

8. Monitor groundwater quality and implement improvement strategies such as phytoremediation if necessary
9. Enhance the existing native habitat by encouraging habitat protection, promoting native habitat restoration, and providing management strategies to counteract the effects of fire and flood suppression
10. Maintain habitat connectivity for wildlife along the San Diego River corridor
11. Promote appropriate integration of recreation and wildlife by managing for recreational users and designing to prevent impacts to sensitive species.
12. Provide interpretive signage about the natural history of the river
13. Educate the public about the plants and animals of the region and their potential impacts on them
14. Encourage local schools, colleges and universities to utilize the area as a natural outdoor laboratory
15. Coordinate connections with Cactus Park, San Vicente Reservoir and Willowbrook Golf Course and enhance these recreational areas to better reflect their riverside locations
16. Create a continuous river park trail, connecting with trails in adjoining reaches
17. Create opportunities for connections to existing local trails
18. Provide additional opportunities for recreational areas and trails, and preserve open space, including retired mining operations, for future public access for a growing population
19. Provide signage at all river crossings and where river park trails cross streets and roads



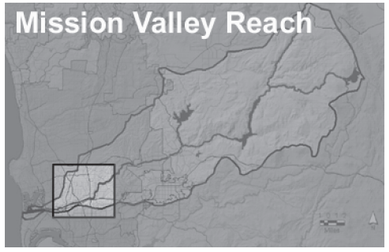
Santee

Santee has planned for parkland and trails along the length of the river through the city. Recommendations for Santee focus on management practices and educational opportunities to improve water resources and habitat.

1. Enhance the recognition of the Kumeyaay village site of Sinyeweche
2. Enhance the preservation and management of the agriculture and mining heritage of the area by working with the local community and designing to reflect the cultural influences of the area
3. Facilitate public education about the history of the river, revealing the changes to the river valley caused by sand mining and channelization
4. Prevent increased runoff and decreased groundwater infiltration by maintaining and promoting the use of permeable surfaces and facilitating public education about the impacts of runoff
5. Prevent further development within the floodplain
6. Develop a program for the removal of nonnative vegetation in the river that can worsen the impacts of flooding.
7. Prevent deterioration of water quality by maintaining riparian habitat, promoting good management practices for agriculture, recreational facilities and golf courses, utilizing vegetated filters and stormwater treatment areas for runoff flowing into the river or tributaries from developed areas, and educating the public about how their actions affect water quality downstream
8. Monitor groundwater quality and implement improvement strategies such as phytoremediation if necessary
9. Enhance the existing native habitat by encouraging habitat protection, promoting native habitat restoration, and providing management strategies to counteract the effects of fire and flood suppression
10. Maintain habitat connectivity for wildlife along the San Diego River corridor
11. Promote appropriate integration of recreation and wildlife by managing for recreational users and designing to prevent impacts to sensitive species
12. Improve interpretive signage about the natural history of the river
13. Encourage local schools, colleges and universities to utilize the area as a natural outdoor laboratory
14. Connect with trails along the river in adjoining reaches
15. Create opportunities for connections to existing local trails
16. Provide signage at all river crossings and where river park trails cross streets and roads
17. Encourage the establishment of a community based organization to help maintain and monitor the River Park

Mission Trails Regional Park
This large regional park is an existing jewel in the center of the proposed river park. Recommendations are focused on management practices for the park and connections to surrounding areas.

1. Coordinate with MTRP to promote the cultural identity of the river and enhance the preservation and management of historic resources including Kumeyaay village sites artifacts and the Mission Dam and Flume National Historic Landmark
2. Prevent increased runoff and decreased groundwater infiltration by maintaining and promoting the use of permeable surfaces and facilitating public education about the impacts of runoff
3. Prevent deterioration of water quality by maintaining riparian habitat, and educating the public about how their actions affect water quality downstream
4. Monitor groundwater quality and implement improvement strategies such as phytoremediation if necessary
5. Enhance the existing native habitat by encouraging habitat protection and native habitat restoration, and by implementing management strategies to counteract the effects of fire and flood suppression
6. Maintain habitat connectivity for wildlife along the San Diego River corridor
7. Promote appropriate integration of recreation and wildlife by managing for recreational users and designing to prevent impacts to sensitive species
8. Expand interpretive signage about the natural history of the river
9. Continue to encourage local schools, colleges and universities to utilize the area as a natural outdoor laboratory
10. Connect with trails along the river in adjoining reaches
11. Coordinate river park trail and recreational area planning efforts with those of MTRP
12. Create opportunities for connections to existing local trails
13. Provide signage at all river crossings and where river park trails cross streets and roads

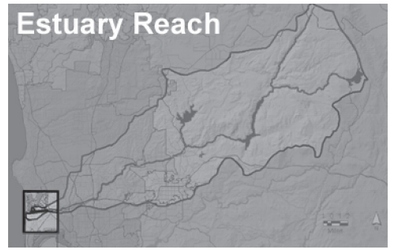


Mission Valley
Mission Valley is a dense urban area with highly impacted water quality, habitat and limited public open space. It is also the site of much rich cultural history. Recommendations for this reach include increasing recognition and preservation of historic resources, managing for improved water quality, improving habitat quality and providing additional recreational areas.

1. Enhance the recognition of the Kumeyaay village sites of Cosey and Nipaguay
2. Coordinate with Presidio Park, Mission San Diego de Alcala, Old Town State Historic Park to promote the recognition of the river's important role in San Diego History
3. Work to preserve the portion of Mission Flume that is within private property
4. Facilitate public education about the history of the river corridor as the first transcontinental mail route and its role in supplying the infrastructure materials for the building of early San Diego
5. Preserve remaining free-flowing stretches of the river and its tributaries to prevent further alteration of sediment transport processes
6. Prevent increased runoff and decreased groundwater infiltration by maintaining and promoting the use of permeable surfaces and facilitating public education about

runoff impacts

7. Prevent further development within the flood plain
8. Develop a program for the removal of nonnative plants in the river that can worsen the impacts of flooding
9. Prevent deterioration of water quality by maintaining riparian habitat, promoting good management practices for recreational facilities and golf courses, utilizing vegetated filters and stormwater treatment areas for runoff flowing into the river or tributaries from developed areas, and educating the public about how their actions affect water quality downstream water quality
10. Monitor groundwater quality and implement improvement strategies such as phytoremediation if necessary
11. Enhance the existing native habitat by encouraging habitat protection and native habitat restoration, and by implementing management strategies to counter act the effects of fire and flood suppression
12. Maintain habitat connectivity along the San Diego River corridor
13. Promote appropriate integration of recreation and wildlife by designing to prevent impacts to sensitive species
14. Educate the public about the plants and animals of the region and their potential impacts on them
15. Encourage local schools, colleges and universities to utilize the river corridor as a natural outdoor laboratory
16. Coordinate connections with FISDRIP, Admiral Baker Golf Course and Riverfront Golf Course (if it remains as a golf course), enhancing these recreational areas to better reflect their riverside locations
17. Create a continuous river park trail connecting with trails in adjoining reaches
18. Create opportunities for connections to existing local trails
19. Provide additional opportunities for recreational areas and trails, and preserve open space for public access, designing for a sense of safety within the river park
20. Provide signage at all river crossings and where river park trails cross streets and roads
22. Work with the visitor industry to enhance the role of the river park as part of the visitor experience



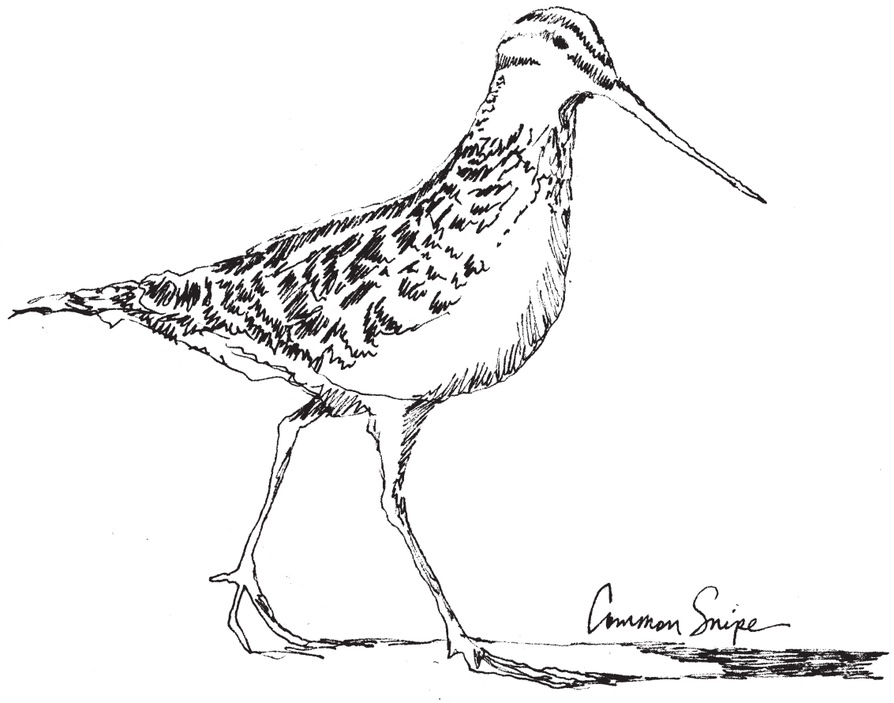
Estuary

Where the San Diego River finally meets the Ocean, is a popular recreation area with abundant yet impacted wildlife, poor water quality and obscured historical resources. Recommendations focus on improving recreational areas, reducing impacts on wildlife, managing to improve water quality and highlighting historical significance.

1. Enhance the recognition of the Kumeyaay village sites of Paulpa
2. Increase public awareness about the changes to the river by illustrating the river's historic water route to the San Diego Bay and the estuary's historic landscape
3. Facilitate public education about the history of the river corridor as the first transcontinental mail route and its role in supplying the infrastructure materials for the building of early San Diego
4. Prevent increased runoff and decreased groundwater infiltration by maintaining and promoting the use of permeable surfaces and facilitating public education about the impacts of runoff
5. Prevent deterioration of water quality by maintaining riparian habitat, promoting good management practices for recreational facilities utilizing vegetated filters and stormwater treatment areas for runoff flowing into the river or tributaries from developed areas, and educating the

public about how their actions affect water quality downstream

6. Enhance the existing native habitat by encouraging habitat protection and native habitat restoration, and by implementing management strategies to counteract the effects of flood suppression
7. Maintain habitat connectivity along the San Diego River corridor
8. Promote appropriate integration of recreation and wildlife by designing to prevent impacts to sensitive species, especially at the sensitive estuary
9. Educate the public about the plants and animals of the region and their potential impacts on them
10. Encourage local schools, colleges and universities to utilize the river corridor as a natural outdoor laboratory
11. Coordinate connections with Robb Field Recreation Center, Dusty Rhodes Park, Famosa Slough and Dog Beach, enhancing these recreational areas to better reflect their riverside locations
12. Enhance the existing trail along the San Diego River connecting with trails in the adjoining reach
13. Create opportunities for connections to existing local trails
14. Provide additional opportunities for recreational areas and trails, and preserve open space for public access, designing for a sense of safety within the river park
15. Provide signage at all river crossings and where river park trails cross streets and roads



Pattern Recommendations

Process

Recommendations for the application of Design Patterns in each reach are generated through an analysis of each pattern's suitability within each reach. The Pattern Recommendations complement the Design Recommendations, helping to form the detailed designs of specific areas within the river park. These recommendations are meant to provide general guidance as to the range of possibilities for pattern application in each reach. These recommendations are summarized in the accompanying matrix, which also shows existing similar facilities in each reach. A description of how these recommendations can be used in the design of parks within the river park is provided in Chapter Five, Site Design.

Headwaters

The headwaters can benefit from the applications of design patterns within the river corridor and surrounding areas. Most portions of the river in this reach are proposed for Wilderness and Wild and Scenic River Designation, meaning protected areas would remain roadless and off-limits to mechanized vehicles. Stormwater treatment was not recommended because no urban areas are adjacent to the river in this reach. Phytoremediation was thought to be incompatible with the natural character of Wilderness Designation. Wildlife underpasses are not necessary in roadless areas. Bicycles are considered mechanized vehicles and are not allowed in wilderness areas, making bicycle facilities unnecessary. Lighting and emergency phones, playgrounds, amphitheaters, recreational fields, golf courses and commercial edges were all deemed inappropriate in the river's protected natural areas.

Reservoir to 67 Freeway

Reservoir to 67 Freeway offers opportunities for application of almost all of the design patterns. Golf courses can have serious impacts on both water and habitat, and new golf courses are not recommended in the river park. Commercial edges are not recommended due to the rural character of this reach.

Lakeside

Lakeside currently has few river park facilities yet offers opportunities for application of almost all of the patterns

Santee

Santee has many river park facilities and offers opportunities for the application of almost all of the patterns. New golf courses are not recommended for the river park.

Mission Trails Regional Park

Mission Trails Regional Park is a well-developed park facility, but the incorporation of design patterns could enhance its integration into the river park system. Phytoremediation is not recommended within this park because it would not be compatible with its natural character. Recreational fields and commercial edges, again, are incompatible, and golf courses are not recommended for the river park.

Mission Valley

The river becomes very urbanized in Mission Valley and this effects the pattern recommendations. Bobcat corridors are no longer recommended, because bobcats are very unlikely to pass so far into urban areas, and they would likely be harmed on busy streets and roads. Horse facilities are currently not provided in this reach, and due to the urban nature are not recommended. New golf courses are not recommended within the river park.

	Headwaters	Reservoir - 67	Lakeside	Santee	MTRP	Mission Valley	Estuary
W-1 Stream Meanders	●	●	●	●	●	●	●
W-2 Bank Restoration	●	●	●	●	●	●	●
W-3 Infiltration Zones	●	●	●	●	●	●	●
W-4 Vegetated Swales	●	●	●	●	●	●	●
W-5 Detention Basins	●	●	●	●	●	●	●
W-6 Retention Basins	●	●	●	●	●	●	●
W-7 Stormwater Treatment		●	●	●	●	●	●
W-8 Phytoremediation		●	●	●		●	
H-1 Habitat Restoration	●	●	●	●	●	●	●
H-2 Habitat Corridor	●	●	●	●	●	●	●
H-3 Bobcat Corridor	●	●	●	●	●		
H-4 Wildlife Underpasses		●	●	●	●	●	
H-5 Sensitive Species Area	●	●	●	●	●	●	●
H-6 Native Landscaping	●	●	●	●	●	●	●
P-1 Access Points	●	●	●	●	●	●	●
P-2 Bicycle Facilities		●	●	●	●	●	●
P-3 Public Transit Access	●	●	●	●	●	●	●
P-4 Parking	●	●	●	●	●	●	●
P-5 Horse Facilities	●	●	●	●	●		
P-6a SDRP Trail	●	●	●	●	●	●	●
P-6b Spur Trails	●	●	●	●	●	●	●
P-6c Horse Trails	●	●	●	●	●		
P-7 Road Crossings	●	●	●	●	●	●	●
P-8 View Spots	●	●	●	●	●	●	●
P-9 Water Access	●	●	●	●	●	●	●
P-10 Kiosks	●	●	●	●	●	●	●
P-11a River Signage	●	●	●	●	●	●	●
P-11b Directional Signage	●	●	●	●	●	●	●
P-11c Interpretive Signage	●	●	●	●	●	●	●
P-11d Regulatory Signage	●	●	●	●	●	●	●
P-12 Lighting /Phones		●	●	●	●	●	●
P-13 Benches	●	●	●	●	●	●	●
P-14 Restrooms	●	●	●	●	●	●	●
P-15 Maintenance Centers	●	●	●	●	●	●	●
P-16 Playgrounds		●	●	●	●	●	●
P-17 Picnic Areas	●	●	●	●			●
P-18 Amphitheaters		●	●	●	●	●	●
P-19 Art	●	●	●	●	●	●	●
P-20 Recreational Fields		●	●	●		●	●
P-21 Golf Courses							
P-22 Commercial Edges			●	●		●	

Existing ● Recommended

Pattern recommendations per reach

Estuary

The estuary provides the opportunity for the application of many of the patterns. Phytoremediation is not recommended because of the groundwater's proximity to the salty ocean. Horse facilities are not currently provided and are not recommended for this already heavily used portion of the river. New golf courses are not recommended within the river park.

Headwaters

The abundance of native landscape and dramatic scale influence the design character.

Material:
- Craggy rocks in higher elevations
- River rocks in lower elevations

Form:
- Natural, simple curves
- Blend in with the surroundings by keeping the elements unobtrusive

Color:
- Oak green
- Manzanita blue
- Deep rust

Reservoir to 67 Freeway

The native landscape as well as the introduction of agriculture influence the design character.

Material:
- River rocks
- Sand
- Wood

Form:
- Rustic, not refined
- Play off elements of agriculture

Color:
- Sky blue
- Sand
- Oak green

Lakeside

The rock outcrops on distant hillsides, subdued colors of the earth and the historic presence of agriculture influence the design character.

Material:
- Smooth boulders
- Metal
- Sand

Form:
- Historic grid of agriculture
- Organic cottonwood and sycamore shapes
- Unrefined

Color:
- Dusty pink
- Rust
- Sycamore yellow
- Cottonwood green

Santee

The native valley landscape as well as the encroaching development influence the design character.

Material:
- Boulders
- Sand
- Metal

Form:
- More refined
- Play off the geometry of development

Color:
- Sky blue
- Sand
- Sycamore yellow
- Cottonwood green

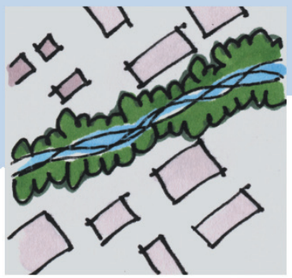
MTRP

The gorge and its striking natural surroundings influence the design character.

Material:
- Sandstone
- River rocks

Form:
- Layered
- Organic
- Upright forms

Color:
- Deep and light rusts
- Cottonwood green
- Saffron yellow
- Buckwheat silver



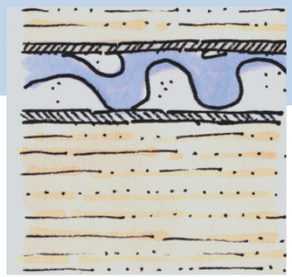
Mission Valley

The oversized scales of natural and built forms and the historical changes that have been made to the river influence the design character.

Material:
- Sand
- Metal
- Ceramic tile
- Glass
- Small rocks

Form:
- Historic meander and flood of the river
- Organic forms for the historic reference
- Grid forms for the contemporary structure

Color:
- Clear blue
- Willow green
- Cottonwood green



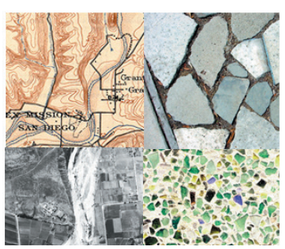
Estuary

The strong coastal and beach lifestyle influence the design character.

Material:
- Sand
- Ceramic tile
- Glass
- Driftwood
- Small rocks

Form:
- Alluvial flow

Color:
- Washed colors



EXPERIENCING THE SAN DIEGO RIVER PARK

To further the process of seeing the future of the San Diego River Park, envision yourself on your bicycle at the newly installed access point and bicycle facility near El Capitan Reservoir, and join the virtual bicycle tour on its way from the eastern end the river park to the Pacific Ocean...

Reservoir to 67 Freeway
In the shadow of El Cajon Mountain, under shady oaks, the trail meanders along the sandy San Diego River wash.

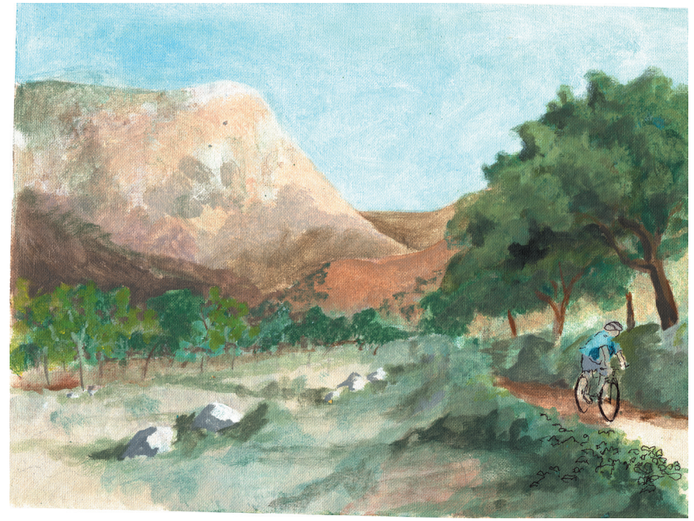
Lakeside
As the valley opens up, passing through a grove of cottonwood trees the trail looks out upon the landscape as it becomes increasingly suburban.

Santee
Continuing in the open valley, the trail passes through the heart of Santee's natural river corridor and its bustling urban center.

Mission Trails Regional Park
Escaping into the quiet wonder of Mission Trails Regional Park, the trail is surrounded by chirping birds and by rustling leaves.

Mission Valley
Entering a dense urban area enclosed by high mesa walls and large built structures, the trail passes between the green river corridor and busy commuter activity.

Estuary
Arriving at the wide open vistas of the estuary with expansive views of parks and beaches the trail leads along the river's edge to its final destination at the Pacific Ocean.



Reservoir to 67 Freeway

Mission Trails Regional Park

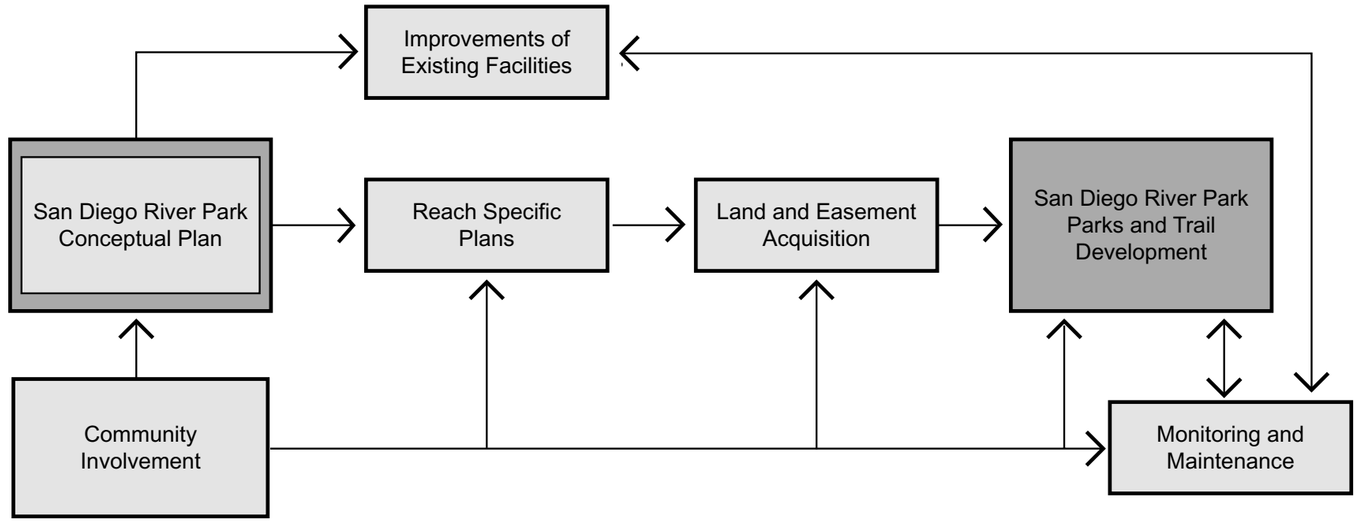
Lakeside

Santee

Mission Valley

Estuary

IMPLEMENTATION PLAN



The process of building the San Diego River Park will occur over many years and with the combined efforts of many individuals, public agencies and private organizations. This document represents only a first step in a long process of implementation. It is necessary to understand the process as a whole to understand the actions that need to be taken now to move the park project forward. The implementation plan for the San Diego River Park has been divided into three distinct phases, with each subsequent phase following upon the completion of the previous phase.

PHASE ONE

Phase one involves the development of Reach Specific Plans, improvements of existing facilities, and community outreach.

Reach Specific Plans

The next step in the design process of the San Diego River Park is the development of specific plans for the reaches of the river park. Working within the framework of the San Diego River Park Conceptual Plan, the specific plans for each reach will develop planning goals and objectives, a plan illustrating the aims for this particular section of the river park, and specific recommendations for funding and land and easement acquisition. Following a similar process to the one presented in this document at a smaller and more detailed scale, the specific planning process will involve extensive community involvement and incorporate project goals and recommendations from the conceptual plan.

To facilitate the development of the Reach Specific Plans, the following studies should be undertaken to gain a better understanding of the context of each reach:

1. Conduct a trail and bikeway feasibility study to address the specific planning issues of developing continuous trails throughout the proposed river park. Focus on opportunities for increased public access to the river.

2. Analyze possible funding opportunities, including federal, state, local, and private sources, and strategies to best secure funding options.

3. Examine opportunities for the San Diego River Park to take advantage of restoration and land acquisition necessitated by mitigation requirements. Develop strategies so design is compatible with mitigation needs. Options for setting up a mitigation bank for the river park should be considered.

4. Coordinate with local universities, colleges or high schools to conduct a thorough historical inventory of all resources within the proposed river park. A clear understanding of the locations of historical resources is necessary before park construction can take place to avoid inadvertent damage to irreplaceable resources.

5. Coordinate with local universities, colleges or high schools for ongoing habitat research. Begin collecting base data about sensitive species occurrences and begin monitoring potential habitat choke points and degraded areas. Continue monitoring throughout the establishment of the river park and beyond to guide management decisions and gain the greater understanding of the habitat-benefits of urban riparian parks.

6. Develop a better understanding of water quality issues along the river and its tributaries, especially in Mission Valley and other areas with know contamination problems. Include an understanding of the effects of golf courses, locally applied herbicides and pesticides and contamination from underground storage tanks on habitat and wildlife.

Existing Facilities Improvements

Improvements to existing facilities and publicly owned land can begin the process of creating the San Diego River Park:

1. Develop a coordinated habitat restoration and exotic species eradication plan for the entire proposed park. Work with existing groups, organizations and agencies currently performing this work, and conduct outreach to gather more support and volunteers.

2. Improve existing parks and trails within the river park by installing coordinating kiosks and signage relating the river and river park. Develop and implement interpretive signage programs for existing facilities. Explore opportunities for Robb Field and Dusty Rhodes Park, incudling those presented in this document, to improve connections to and recognition of the river's resources.

3. Develop the proposed Mission City River Park and Cottonwood Grove Park (see Appendix A) on publicly owned land, inspiring the community with possibilities for the future of the river park.

Community Outreach

Community outreach is essential to the planning and development of the river park. Increased recognition for the river and the proposed river park can help generate increased support for the park. The river park will belong to the community and it is their involvement and visions for the park that must guide the process:

1. Install San Diego River identification signage at all river crossings including roads, freeways and trolleys to help increase public recognition of the river.

2. Develop and implement educational signage about the San Diego River and the proposed river park for use in San Diego trolleys and at trolley stops and on other public transportation lines.

3. Continue working with the local community through public meetings, seminars and participation at festival and events.

PHASE TWO

Phase Two follows from the specific planning process and community outreach in phase one. This phase involves land and easement acquisition, parks and trail development and ongoing community outreach.

Land and Easement Acquisition

With the completion of Reach Specific Plans, providing reach specific recommendations for funding and land and easement acquisition, acquisition for sites to be incorporated into the river park can begin:

1. Implement recommended funding strategies to raise money for acquisition.

2. Purchase or otherwise acquire land and easements according to the specific planning recommendations.

Parks and Trail Development

As land and easements are acquired, the development of new parks and trails within the river park can begin:

1. Design and construct river park facilities for acquired sites based on the Reach Specific Plans. Use the design process detailed in Appendix A, Site Design, from this document, the San Diego River Park Conceptual Plan, to guide the selection of goals and objectives, elements and character for each site.

2. Construct the portions of the San Diego River Park Trail as opportunities arise; it will serve as the backbone of the park and link existing and future facilities together. Construct local connected trails including spur trails and horse trails. Design with respect to habitat needs and include access spots, public transit access, parking, bike facilities, horse facilities, signage programs and other applicable design patterns as described in the San Diego River Park Conceptual Plan.

3. Design a comprehensive maintenance program for all park facilities before the completion of construction. Ensure that adequate funding and/or volunteer labor is available for the ongoing care of river park facilities.

Ongoing Community Outreach

Public outreach is ongoing during the implementation process of the river park. Strategies in Phase Two build from the outreach in Phase One:

1. Continue strategies for community outreach detailed in Phase One.

2. Hold a public celebration at the opening of the San Diego River Park Trail. Host a bicycle ride along the length of the river and walks in each reach. Make it a quarterly event to watch the seasonal changes along the river.

3. Develop a yearly festival to involve the public in caring for the river park. Events can be held at sites along the park where people can help with restoration, clean up and park maintenance.

PHASE THREE

Phase Three will involve monitoring and maintenance of the established San Diego River Park, as well as ongoing community outreach.

Monitoring and Maintenance

Monitoring and maintenance are essential to the long-term viability of the river park. Strategies must be developed to ensue that these activities can continue as long as the park does:

1. Continue monitoring park resources after park establishment. Monitor historic resources, wildlife and habitat quality, as well as water quality, quantity and sedimentation issues. Adjust maintenance practices as necessary.

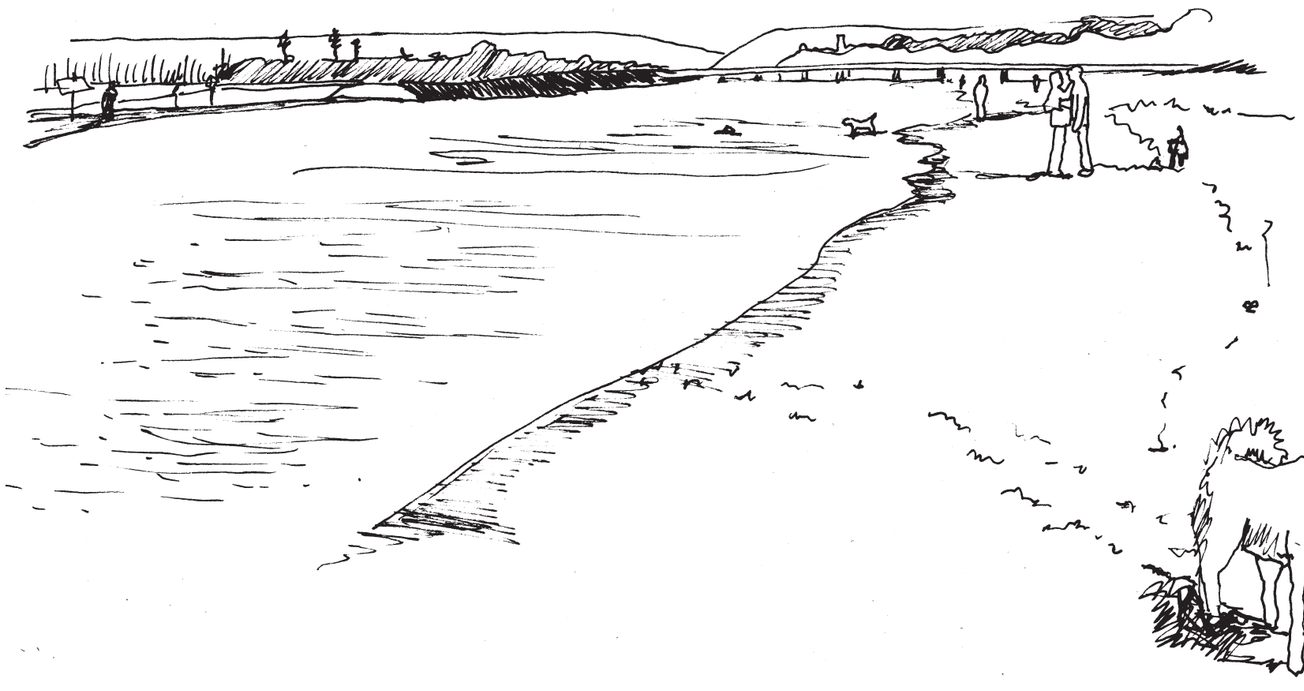
2. Monitor park usage and community needs, develop strategies to ensure that the river park continues to serve the needs of a changing public.
3. Continue to maintain park facilities in a proactive and timely way. Maintain the park as a highly valuable community resource. Ensure that funding and labor strategies developed in Phase Two are adequate to meet the needs of the established park.

Ongoing Community Support

Ongoing community support will benefit and enhance the established river park:

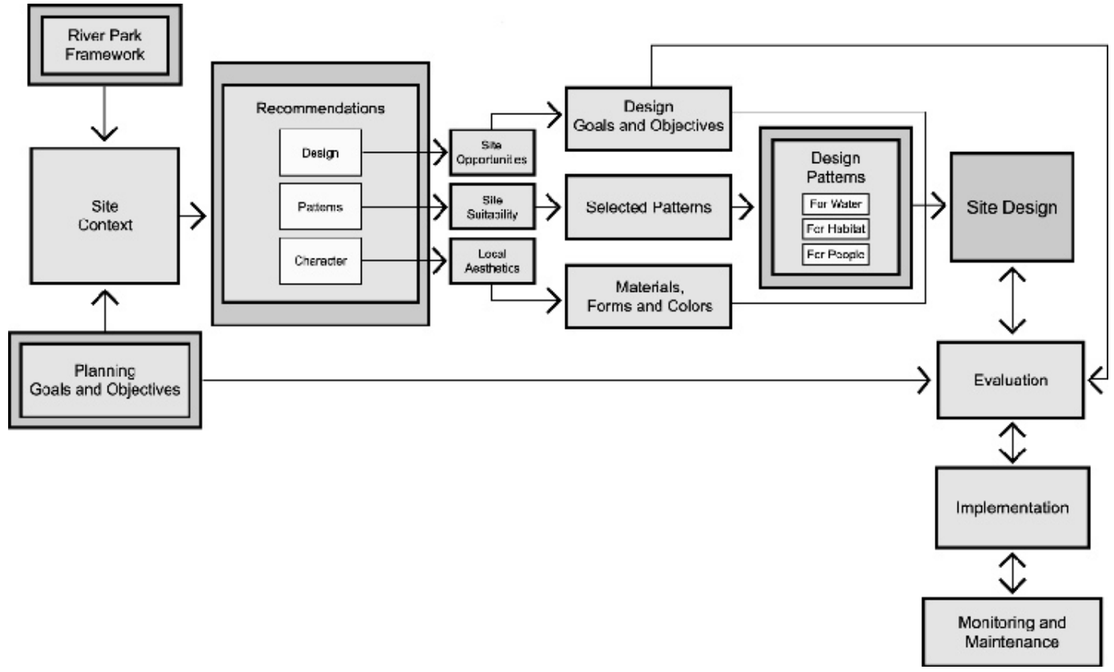
1. Continue the community outreach strategies from Phases One and Two.

2. Develop new strategies reflecting the changing desires and needs of the local community.



Appendices

Appendix A: Site Design



Site Design Process

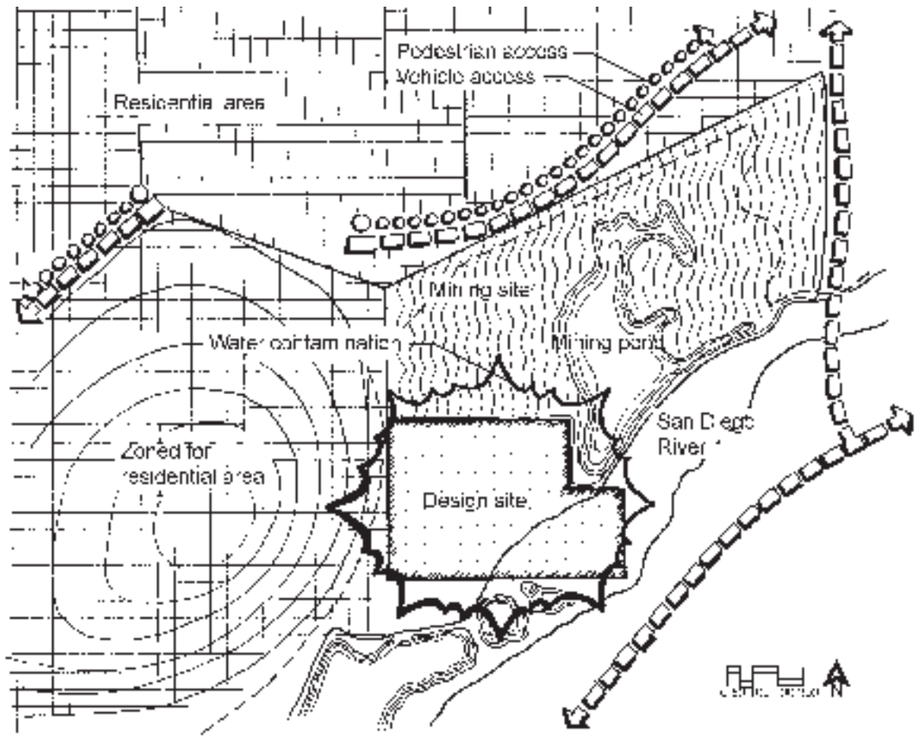
Understanding the San Diego River Park as a whole is only the beginning of actualizing the river park. It is the design of individual sites and easements for parks and trails that will bring this park into reality. This chapter summarizes how the conceptual plan can be applied to site designs and provides three examples to illustrate this process and begin the actualization of the San Diego River Park.

PROCESS

The design process for individual sites within the river park is a process involving gathering data about site context, analysis of this data based on the recommendations provided in this document, the development of goals and objectives, and the intuitive process of design. The recommendations described for each reach of the river park provide design guidance of individual sites within that reach. With a thorough understanding of the site context, the recommendations for the appropriate reach can be applied to help guide the design of individual parks within the river park. An analysis of site context with regard to Design Recommendations leads to the generation of Design Goals and Objectives. An analysis of site context with regard to Pattern Recommendations and Design Goals and Objectives leads to the selection of specific Design Patterns for use in design. An Analysis of the site context with regard to Character Recommendations and selected patterns informs the selection of materials, forms and colors. The individual site design is then created through a creative process including the development of a design concept for the site based on this guidance.

SELECTED DESIGNS

To illustrate the application of the River Park Design Patterns, three typical sites within the proposed park were chosen for detailed design consideration. These sites together show the diverse character and possible functions of the proposed river park. Individually, they demonstrate how the unique opportunities and needs of different sites within the river park can be addressed through the application of appropriate design patterns. The three sites can be seen as pieces adding to and forming the greater whole of the river park, while at the same time each site, at a small scale, captures the nature of the entire San Diego River Park.



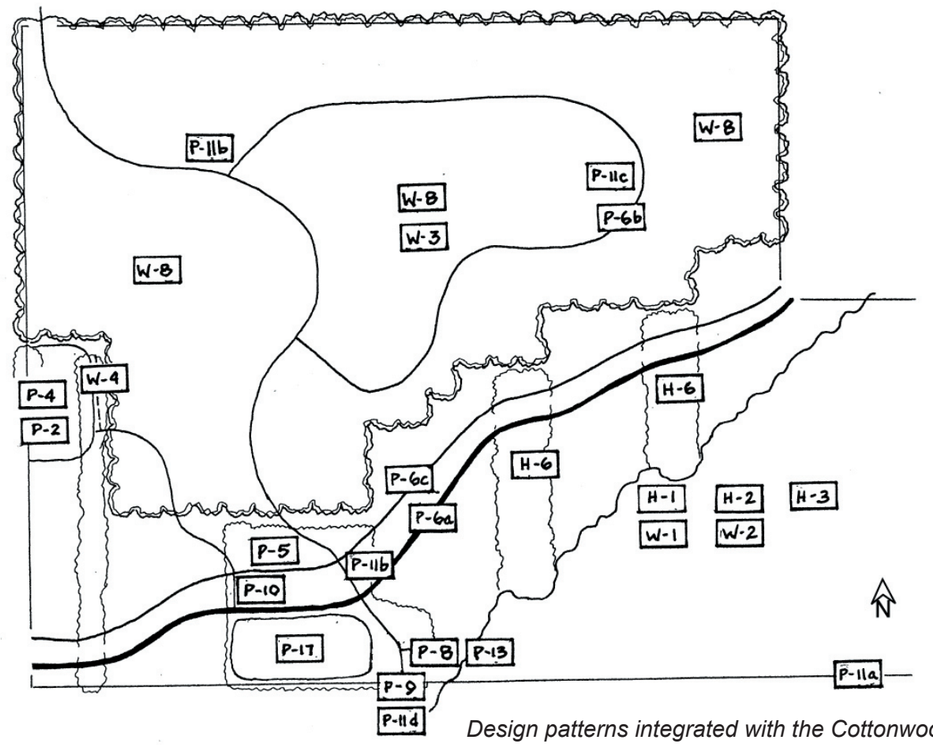
Site context of Cottonwood Grove Park

Cottonwood Grove Park, Lakeside

Located near the Santee city border at the western edge of the Lakeside reach, the proposed Cottonwood Grove Park will serve as a gateway to the river trails and parks in the Lakeside area. Featuring a grove of native cottonwood trees working to clean the contaminated groundwater at the site over time, echoing the site's past use as a water treatment area, this park will create a striking visual landmark in the local landscape.

Site Context

The site is situated on the north bank of the San Diego River, between the local landmarks of "tank hill", proposed for future residential development, and a sand mining operation in its final phase, proposed for future river park or industrial development. Open land to the north of the site is also proposed for future residential development. Two unused water treatment tanks remain on the site, but no other structures are present. The groundwater in the area, located approximately twenty seven feet below the surface, is believed to be contaminated with MTBE, as well as nitrates and iron magnesium. No road access currently exists to the site, with only a dirt trail leading from the end of Riverside Drive into the site. A proposed multiuse trail will cross the site, linking the Santee portion of the river park with the Lakeside portion, and an existing trail, just north of the site connects to the Eucalyptus Hills to the north. The site is flat and bare of most vegetation with much evidence of off-road vehicle activity, except in the southeast corner where the land slopes down to the river and riparian habitat flourishes. Popular fishing and river access areas lie just to the south of the site along weirs in the river. The entire site is within the one hundred year flood plain. This area was identified as an opportunity for increasing access along the river during a community workshop, and constraints identified included lack of legal access to the river.



Design patterns integrated with the Cottonwood Grove Park

Design Goals and Objectives

Based on the site context and Design Recommendations for Lakeside found in Chapter Four, the following list of goals and objectives were prepared for this park:

Celebrate the river's cultural resources

- Design to reflect the agricultural heritage of Lakeside

Support natural stream processes

- Maintain permeable surfaces within the park to prevent increases in runoff entering the river and decreases in groundwater infiltration
- Prevent further development within the floodplain by creating a park which does not include buildings or large structures
- Prevent deterioration of water quality in the river by preserving riparian habitat and utilizing vegetated swales adjacent to parking and equestrian areas
- Improve groundwater through the process of phytoremediation
- Take advantage of opportunities to educate the public about groundwater quality issues and provide an opportunity for local schools, colleges or universities to study the phytoremediation process

Preserve and enhance riparian habitat

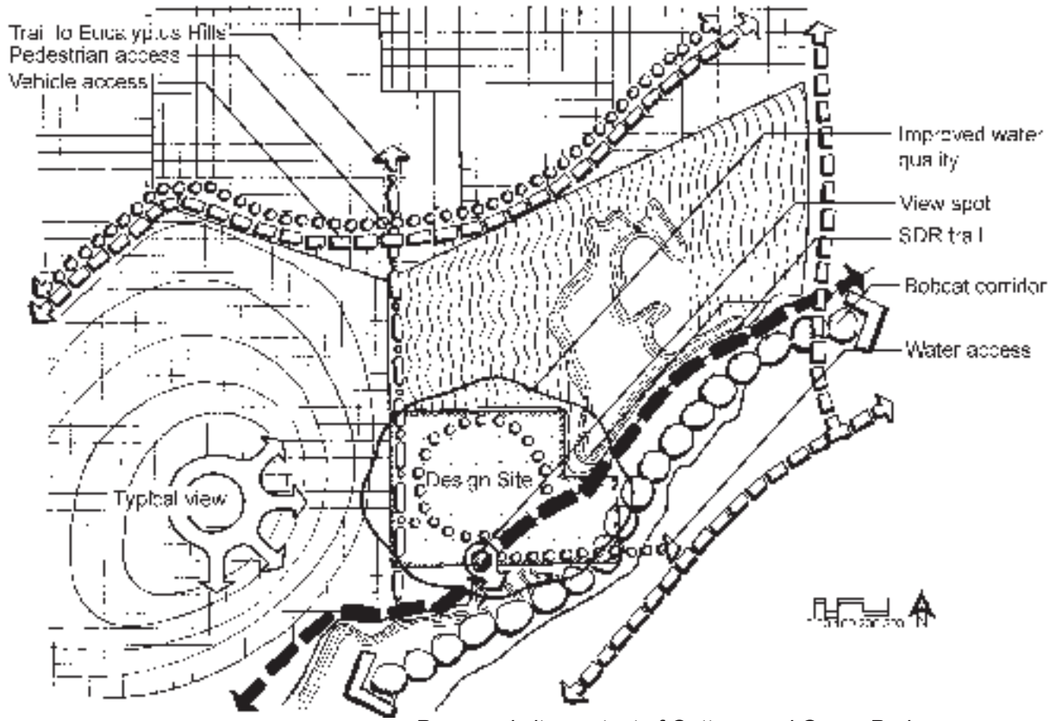
- Enhance existing habitat by preserving habitat in the riparian corridor and restoring native habitat adjacent to the river
- Maintain connectivity for habitat and bobcats through the site
- Design for appropriate integration of recreation and wildlife
- Provide interpretive signage about the natural history of the river

Provide recreational opportunities

- Create a link in the continuous San Diego River Park Trail along the length of the river
- Connect to the trails to ethe Eucalyptus Hills and Santee
- Preserve open space for public access

Selected Design Patterns, Materials, Forms and Colors

Design Patterns for use at this site were selected through an analysis of the Design Patterns appropriate to Lakeside and the Design Goals and Objectives based on site context. The patterns chosen for use were: Stream Meanders (W-1), Bank Restoration (W-2), Infiltration Zones (W-3), Vegetated Swales



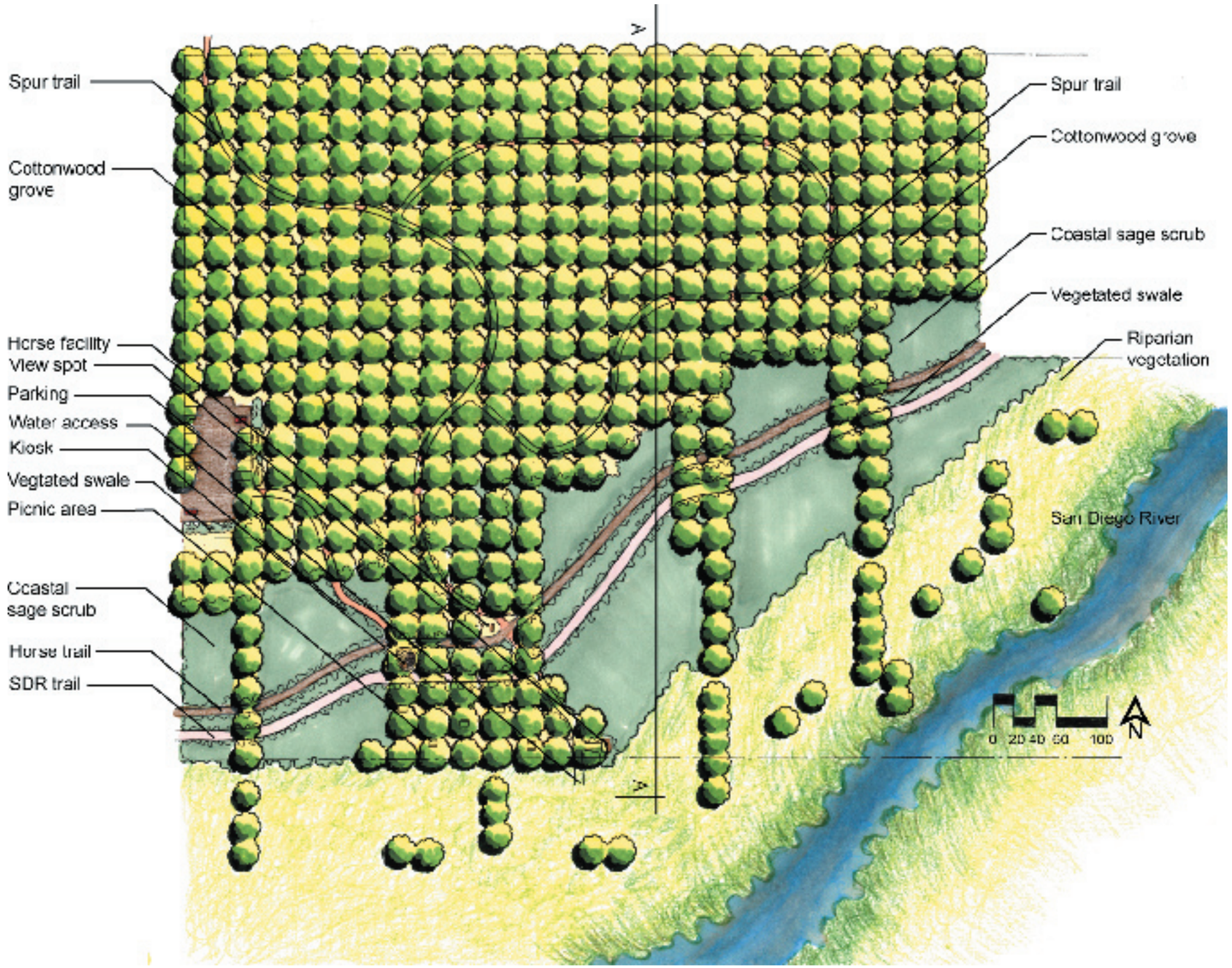
Proposed site context of Cottonwood Grove Park

(W-4), Habitat Restoration (H-1), Habitat Corridor (H-2), Bobcat Corridor (H-3), Native Landscaping (H-6), Bicycle Facilities (P-2), Parking (P-4), Horse Facilities (P-5), San Diego River Park Trail (P-6a), Spur Trails (P-6b), Horse Trails (P-6c), View Spots (P-8), Water Access (P-9), Kiosks (P-10), River Signage (P-11a), Directional Signage (P-11b), Interpretive Signage (p-11c), Regulatory Signage (P-11d), Benches (P-17), Picnic Areas (P-17).

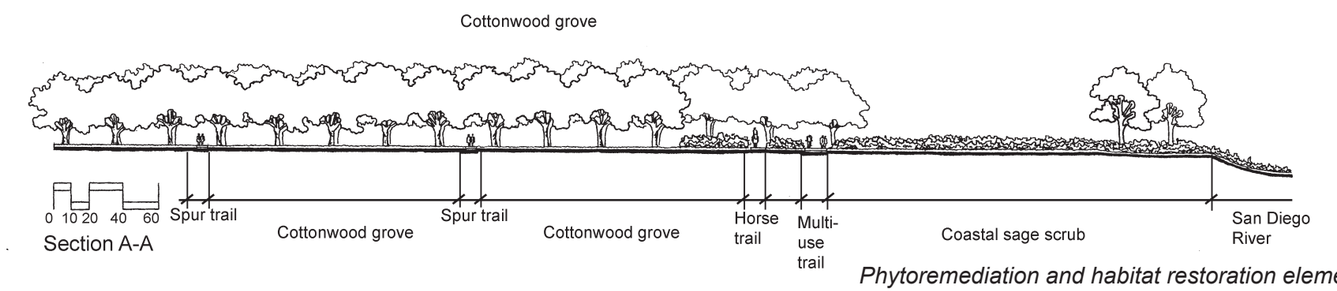
Materials, forms and colors were influenced by the local aesthetics of the area and the chosen design patterns include smooth boulders from the surrounding hills and metal from the industrial influence of sand mining operations. Forms include the historical grid of agriculture and the organic forms of the river. Colors reflect the natural surroundings with sycamore shades of pale brown and light green and reflect the industrial character with rust tones.

Design Concept

The primary feature of Cottonwood Grove Park will be the cottonwood grove itself. The grove, in the form of a grid, forty feet on center, reflecting surrounding local grids created by both agriculture and residential development, will be using the process of phytoremediation to remove toxins from the groundwater beneath the site. The deep reaching roots of the cottonwoods will be able to penetrate into the contaminated groundwater supply, and the fast paced metabolism of the cottonwoods will allow them draw up and store the toxins, over time leading to cleaner local groundwater. Test wells will be installed and monitored to document the effectiveness of the treatment. This process offers the opportunity for school and community involvement in the ongoing monitoring of the site, and offers an excellent opportunity for public education about groundwater contamination and the benefits of low-cost phytoremediation.



Cottonwood Grove Park Site Design



Phytoremediation and habitat restoration elements

Buffered equestrian and bicycle trails provide Santee and Lakeside residents convenient access to the river

Cottonwood Grove Park Design

The proposed cottonwood grove is located on the northern portion of the property, leaving the southern portion of the property adjacent to the river more open and natural. Existing riparian habitat will be maintained and enhanced through restoration providing a wildlife corridor suitable for the movement of bobcats through the area. A wooden deck on the edge of the riparian area provides a view spot for the observation of birds and other wildlife. Interpretive signage shows common birds, lizards and snakes that might be seen at the park.

Adjacent to the riparian habitat, native Diegan coastal sage scrub will be reestablished to increase habitat and to serve as a buffer to the riparian habitat areas. A twelve-foot paved pedestrian and bicycle path, a portion of the San Diego River Park Trail, will traverse through the buffer area east to west, linking proposed trails through Santee and Lakeside. A parallel, eight-foot wide, compacted earth equestrian trail is provided on the north side of the pedestrian and bicycle trail, keeping trail widths narrower to discourage the establishment of brownheaded cowbirds which parasitizes the nest of the endangered least Bell's vireo.

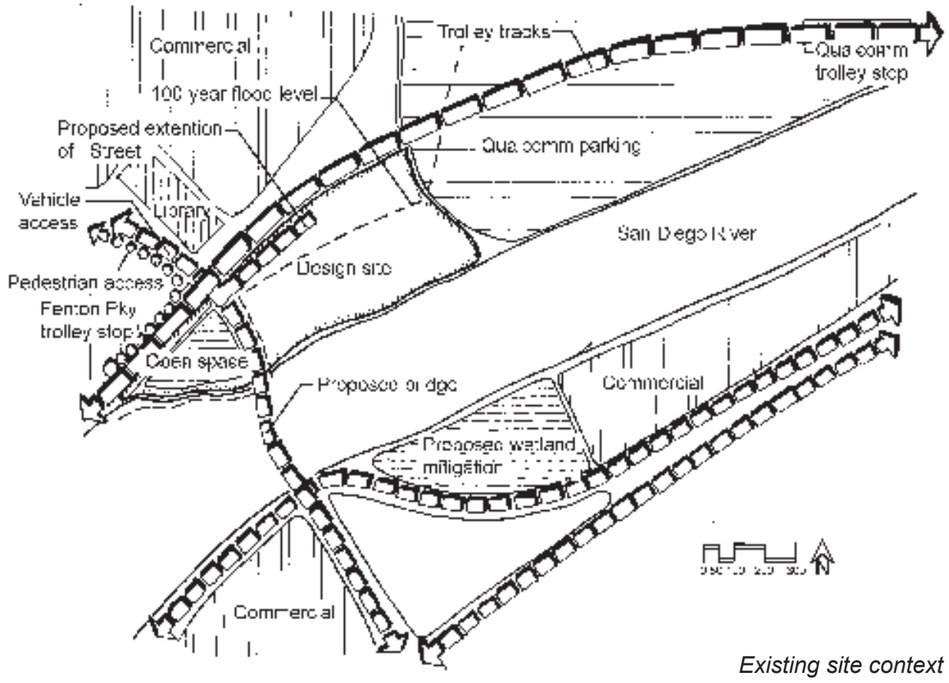
An eight-foot wide, compacted earth trail runs through the site, south to north, and links to water access opportunities located just south of the park, past a family picnic area located within the buffer and shaded by cottonwood trees, up through the cottonwood phytoremediation grove, and connecting to an existing trail to the Eucalyptus Hills. Six-foot compacted earth side trails meander

Bird's eye view looking east at Cottonwood Grove Park

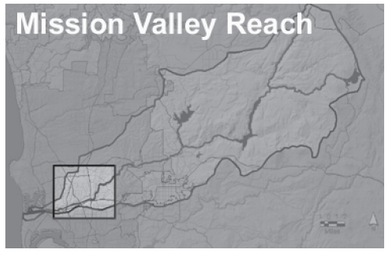
Trail leading to kiosk and node of the park

through the grove and link to a parking area accommodating eighteen vehicles. The compacted earth of the parking area is sloped to catch runoff in a vegetated swale to cleanse it of car related contaminants before it enters the river or groundwater.

Centrally located, where the east to west and south to north trails intersect, a kiosk provides park rules, maps, space for community postings and information about the phytoremediation project. Permanent structures or buildings such as a maintenance center or restrooms are not provided at this site because of its location within the one hundred year floodplain.



Existing site context



Mission City River Park, Mission Valley

Located directly across from the Mission Valley branch of San Diego Public Library and adjacent to the Mission City trolley stop, the proposed Mission City River Park offers great opportunities for recreation and community education. Featuring a maintenance center with a native plant nursery, a sculpted earth amphitheater located within an area of seemingly flood-carved earthen mounds, and recreational fields for active sports, the park will provide the opportunity for the people in Mission Valley to learn about and enjoy the environment of the San Diego River.

Site Context

Mission City River Park will be located on the proposed extension of I Street, from the Fenton trolley stop to Qualcomm Stadium. The design area includes an area proposed for a park and ride for the trolley stop, a large practice field no longer used for football practice. and the portion of the Qualcomm Stadium parking lot south of the trolley tracks. A new road is proposed along the northern edge of the site, and a bridge is proposed to cross the river here along an extension of Mission City Parkway. Groundwater in the area is highly contaminated with MTBE because of leakage from storage tanks located northwest of Qualcomm Stadium, but at the site, the contamination is located sixty- to ninty-feet below the surface and below a level appropriate for phytoremediation. As part of environmental mitigation for the proposed bridge, a reconstructed wetland is proposed directly across the river from the site. This site was identified in a community workshop as providing an opportunity for a park, and the Qualcomm parking lot was also identified as a design opportunity.

Design Goals and Objectives

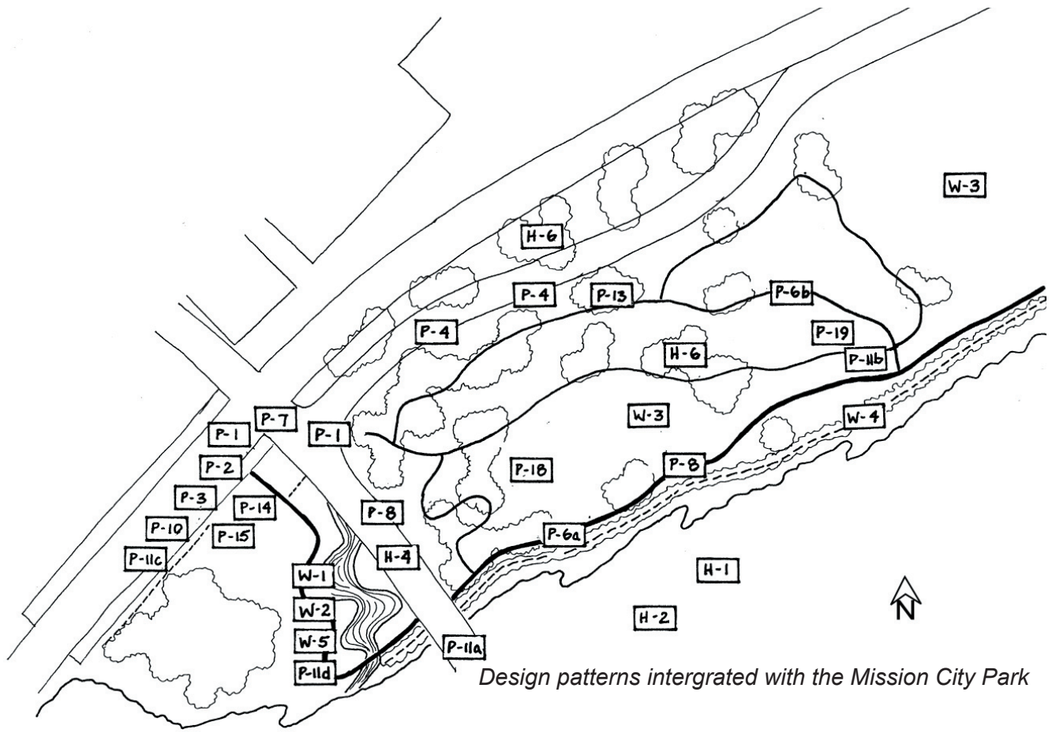
Based on the site context and Design Recommendations for Mission Valley found in Chapter Four, the following list of goals and objectives were prepared for this park:

Celebrate the river's cultural resources

- Connect people with the landscape history of Mission Valley

Support natural stream processes and recognize the natural flooding process

- Naturalize a concrete storm drain channel to restore the free flowing nature of a minor tributary and to increase groundwater infiltration.



Design patterns intergrated with the Mission City Park

- Increase permeable surfaces within the park to decrease runoff entering the river and increase groundwater infiltration
- Prevent further development within the floodplain by creating a park with buildings located outside of the floodplain
- Prevent deterioration of water quality in the river by preserving riparian habitat, promoting good management practices for recreational fields and utilizing vegetated swales adjacent to parking and impermeable surfaces
- Educate the public about the relationship between increased runoff and increased flooding

Preserve and enhance riparian habitat

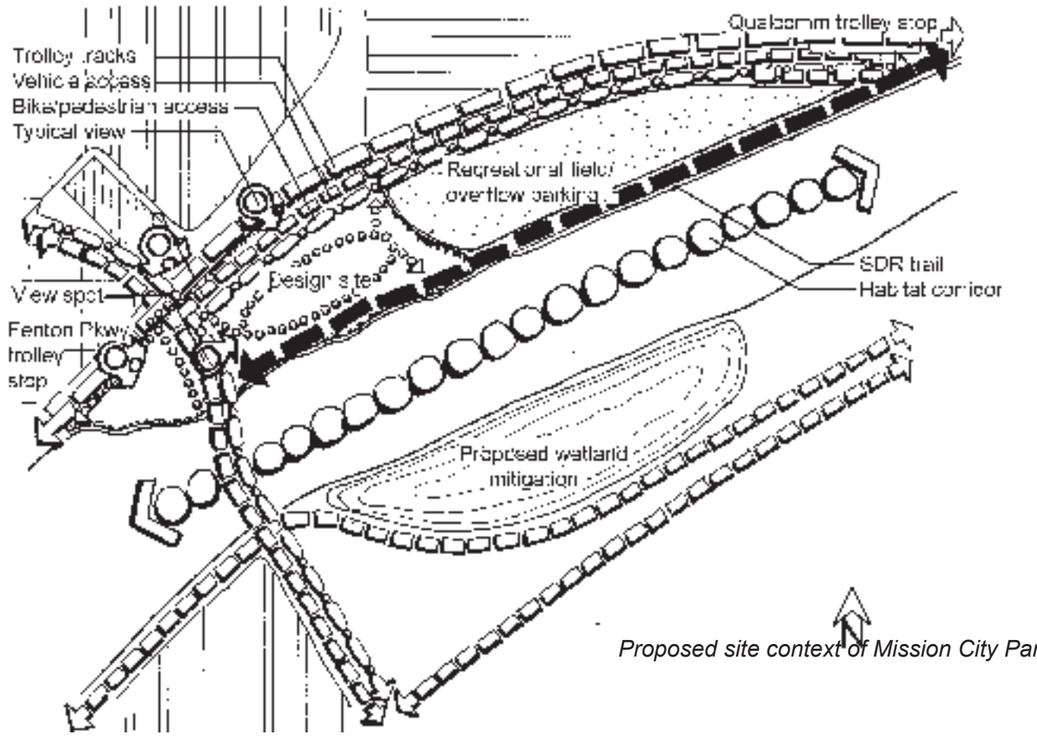
- Enhance existing habitat by preserving habitat in the riparian corridor and restoring native habitat adjacent to the river
- Maintain connectivity for habitat through the site and provide for wildlife to cross under the proposed bridge
- Design for appropriate integration of recreation and wildlife
- Provide opportunities and facilities for the public, including school groups, to learn about the restoration process

Provide recreational opportunities

- Create a link in the continuous San Diego River Park Trail along the length of the river
- Provide for the active recreational space with a playing field and passive recreation space with a strolling park
- Preserve open space for public access
- Design for a sense of safety
- Provide signage at the river crossing and include a pedestrian overlook on the river

Selected Design Patterns, Materials, Forms and Colors

Design Patterns for use at this site were selected through an analysis of the Design Patterns appropriate to Mission Valley and the Design Goals and Objectives based on the site context. The patterns chosen for use were: Stream Meanders (W-1), Bank Restoration (W-2), Infiltration Zones (W-3), Vegetated Swales (W-4), Detention Basins (W-5), Habitat Restoration (H-1), Habitat Corridor (H-2), Wildlife Underpass (H-4), Native Landscaping (H-6), Access points (P-1), Bicycle Facilities (P-2), Public Transit Access (P-3), Parking (P-4), San Diego River Park Trail (P-6a), Spur Trails (P-6b),



Proposed site context of Mission City Park

Road Crossings (P-7), View Spots (P-8), Water Access (P-9), Kiosks (P-10), River Signage (P-11a), Directional Signage (P-11b), Interpretive Signage (P-11c), Regulatory Signage (P-11d), Benches (P-13), Restrooms (P-14), Maintenance Centers (P-15), Amphitheaters (P-18), Art (P-19).

Materials, forms and colors were influenced by the local aesthetics of the area and the chosen design patterns, and include the materials of broken concrete, glass and ceramic tiles, reflecting the impact of flooding on the built landscape. Forms include the grid of the maintenance center reflecting urbanization and organic forms of carved landscape representing the river's flooding capacity. Colors include willow and clear blues.

Design Concept

This park acknowledges and celebrates the river's natural flooding process. Located in an area with frequent flooding, the strolling area of the park imitates the form of sand bars that would have once been located in the river channel. Providing unique sculpted earth form, the park will draw people to contemplate the river's relationship to the local landscape. Benches and an informal amphitheater that appear to have been carved from the sandbars provide opportunities for seating, viewing the river, outdoor education and performances. To provide shade and to help improve groundwater quality, native riparian cottonwood trees are included for their phytoremediation potential even though the contaminated groundwater may be beyond the reach of their roots. A large balcony from the second floor of the Mission Valley Branch of the San Diego Public Library will provide a striking overhead perspective of the park.

Because of its location adjacent to the newly completed library, education is a key component of this park design. The amphitheater is part of the educational programming, and another is the maintenance center and nursery located on the portion of the site that lies above the one hundred year flood plain. The center will provide propagation facilities for use by park employees, local community groups and school groups. These facilities can be used to propagate the local native plants of the river for use in restoration and landscaping projects. Educational components can also be incorporated at the trolley stop adjacent to the center. Commuters and people passing by can learn about the restoration efforts of the river park.

To recognize the role of runoff in flooding of the San Diego River, two elements are proposed to make runoff processes more apparent. Just west of the proposed bridge is a storm drain outlet. In the construction of the bridge, the drain location is to be extended downriver, obscuring the location where the runoff water enters the river. The design of this park proposes to leave the drain in place, and to create a meandering course for the water, creating a stream environment to aerate and filter the water before it enters the river. Signage could identify the source of the water and help educate the public about flooding issues. To illustrate ways in which runoff can be reduced, a portion of the parking for Qualcomm Stadium could be converted to turf recreational fields. The fields could be used for parking on game days and for community activities at other times. Providing increased areas for infiltration can reduce runoff. Again, signage could educate the public about potential flood reduction through reducing impervious surface areas.

Children enjoy the embedded tile mosaic at the entrance to the park

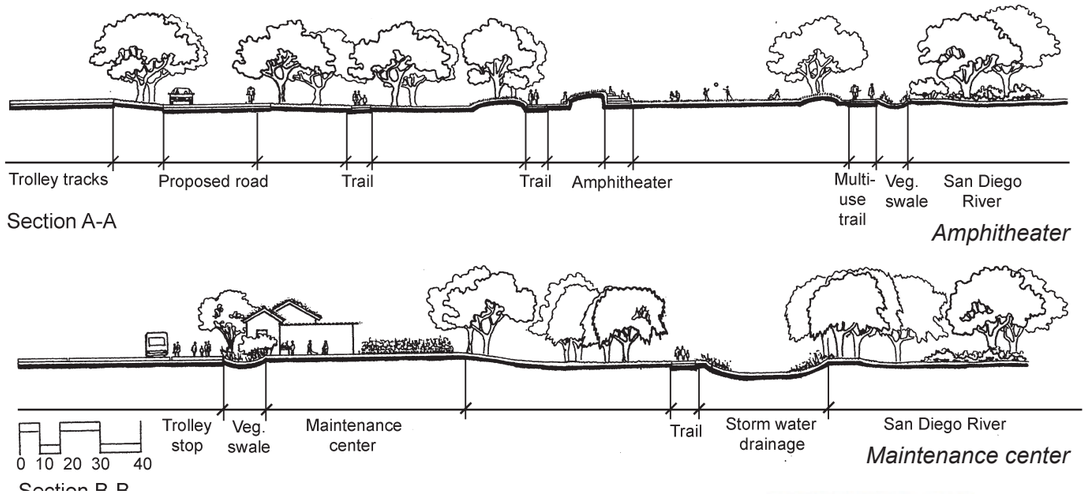
Mission City River Park Design

The western portion of the site, adjacent to the Fenton trolley stop, is higher and outside of the one hundred-year floodplain, and will be the site of the maintenance center. The maintenance center will have a storage building, a shaded outdoor workstation, and plenty of room for compost storage and growing plants. The straw bale storage building, constructed with local, volunteer labor will have a vegetated green roof to demonstrate the runoff reducing and aesthetic qualities of this technology. The workstation and planting areas will be fenced for security, with plenty of room allowed for group activities and educational gatherings. Limited parking is provided for drop-off and access to this facility.

Native riparian and Diegan coastal sage scrub habitat is maintained and enhanced along the western side of the maintenance center, allowing both the natural landscape and the maintenance center that supports it, to be viewed from the trolley. Interpretive signage can be provided at the trolley stop illustrating the restoration process. Adjacent to the maintenance center on the east, an existing storm drain channel, currently flowing in a concrete lined channel to the river, will be restored to a more natural stream channel meandering its way through boulders to the river, aerating and filtering the water as it travels. A compacted earth pedestrian trail, with interpretive signage telling about runoff reduction strategies, follows the shaded, tree-lined stream bank.

The proposed Mission City Parkway Bridge separates the maintenance center from the rest of the park. This design proposes to raise the height of this bridge to allow the streamside pedestrian path to pass under and connect to trails in the strolling area. A pedestrian overlook is also proposed to allow people crossing the bridge to stop and enjoy the riparian views.

Park visitors driving to the park will have street-side parking along the proposed I Street extension, and bicyclers will be provided with bicycle facilities including bike lockers at the trolley stop platform.



Mission City River Park Site Design

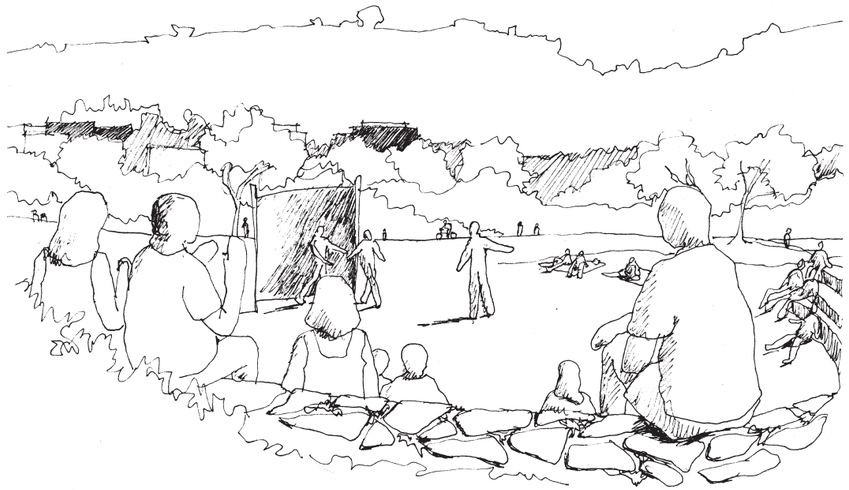
To guide park visitors from the trolley stop, library and street-side parking to the strolling area park entrance, street crossings and sidewalks will be marked by inlaid broken concrete. The broken concrete, which is both recycled and aesthetically interesting, gives reference to the potentially destructive flooding power of the river in this area and allows for increased groundwater infiltration verses conventional paving.

The sidewalk and crosswalks lead visitors to the entry plaza from which the strolling park below can be viewed. A tile mosaic, embedded in the plaza surface, reflects the landscape history of Mission Valley and connects park visitors with the history of the area. From here, paths lead down into the park. The paths follow carved out areas between berms planted with low growing native sages, cottonwoods and sycamores. The berms are low, with most being three feet or lower, to maintain openness and a sense of safety within the park. At resting areas and view spots, benches are carved out and set within the berms. Two taller berms, one supporting the amphitheater seating, give variation and carve out a larger gathering area in the southern portion of the site. The amphitheater seats are embedded with tile mosaics reflecting the entry plaza and celebrating the site's connection to the San Diego River. A small turf lawn is proposed for this area to support gathering and activities associated with the amphitheater.

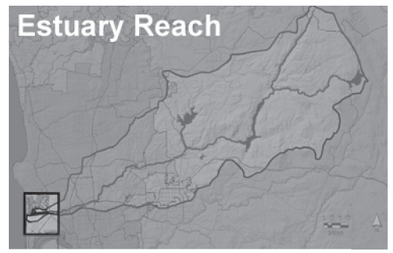
The amphitheater itself seats up to 75 people in an informal setting, with east views into the park and Qualcomm Stadium beyond, and south toward the river. Trees shade some of the seating, which can be used by individuals and small groups when not being used by larger groups or educational gatherings.

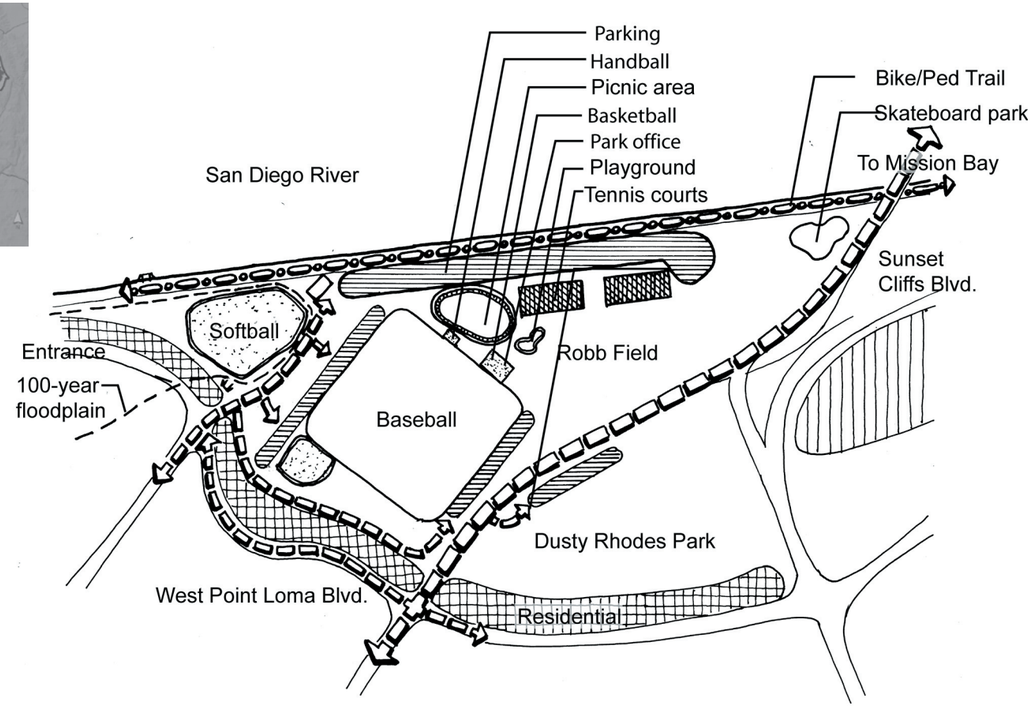
Panorama of Mission City Library, Qualcomm Staduim, Mission City River Park, the maintenance center and trolley stop

The San Diego River Park Trail, a twelve-foot wide paved multiuse trail, passes along the southern edge of the site adjacent to the river. It provides connection to the recreational fields proposed for the Qualcomm Stadium parking lot. These fields can provide areas for active sports, gatherings, festivals and overflow parking on game days. Interpretive signage can describe the process of replacing the asphalt with turf, and the associated benefits to the river. A park and ride facility can also be located here for access to the Qualcomm trolley stop.



Families and schools groups enjoy the bermed amphitheater with the San Diego River as its backdrop





Robb Field and Dusty Rhodes Park context

Robb Field Recreation Center and Dusty Rhodes Park, Estuary

Robb Field is located between the San Diego River estuary to the north and Dusty Rhodes Park just across Sunset Cliffs Boulevard to the south, but remains isolated without strong connections to either. A redesign of this area can provide much stronger connections to the river, acknowledging and celebrating its presence, while maintaining all of the recreational spaces and activities within the parks. The redesign features a pedestrian bridge linking the parks and marking their location, a day-lighted storm drain running through a reconstructed stream bed to cleanse the water before it reaches the river, picnic areas and recreational fields with views of the river, and increased parking.

Site Context

Robb Field is a popular, active sports park located in the community of Ocean Beach. Current park facilities include recreational fields, a football field, horseshoes, a soccer field, and tennis courts. Sports activities include basketball, flag football, soccer, indoor soccer, rugby, softball, tennis and weightlifting. Robb Field Skateboard Park, a public facility with fee-based entry, is also located within the park. Along the northern edge of the park, an asphalt multiuse trail, identified in a community workshop as providing an opportunity for improvement, passes between the park and the channelized slope of the San Diego River. Multitudes of birds, including the federally endangered, light-footed clapper rails and California least terns, congregate in the estuary below. Parking is concentrated along the south side of the multiuse path in a long narrow lot, and additional parking is provided to the south of the softball fields.

Dusty Rhodes Park, a part of Ocean Beach Recreation Center and just across the major thoroughfare of Sunset Cliffs Boulevard, is less programmed for specific activities. The large grass field is used for many diverse activities including lacrosse, Frisbee, soccer, rugby and dog shows. Although very close to Robb Field, no pedestrian access is currently available across the busy street. Because of river channelization, these parks lie beyond the one hundred-year floodplain except for a small area in the northern edge of Robb Field.

Enjoying the riverfront is enhanced by a meandering trail, native vegetation and passive areas for sitting and birdwatching

Design Goals and Objectives

Based on the site context and Design Recommendations for Mission Valley found in Chapter Four, the following list of goals and objectives were prepared for this park:

Celebrate the river's cultural resources

- Connect people with the estuary's historic meandering form by using it for inspiration to guide the placement of the riverside path

Support natural stream processes

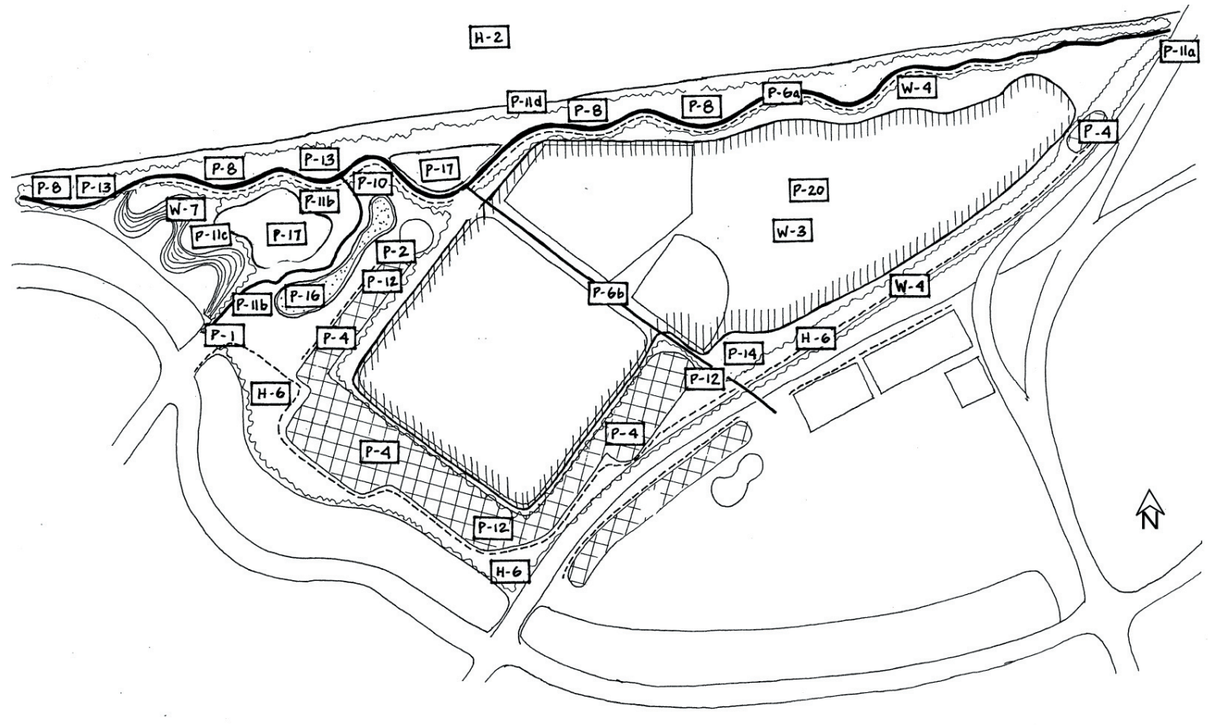
- Replace paved parking lots to increase permeable surfaces within the park to decrease runoff entering the river and increase groundwater infiltration
- Prevent deterioration of water quality in the river by preserving riparian habitat, promoting good management practices for recreational fields and utilizing vegetated swales adjacent to parking and impermeable surfaces
- Provide a stormwater treatment demonstration area to educate the public about the effect of runoff on the estuary's water quality

Preserve and enhance riparian and estuary habitat

- Enhance existing habitat by preserving habitat in the riparian corridor and restoring native habitat along the river channel edge
- Maintaining connectivity for habitat through the site
- Designing for appropriate integration of recreation and wildlife by programming the least impacting activities adjacent to sensitive estuary habitat
- Provide opportunities for public education about estuary birds through interpretive signage

Provide recreational opportunities

- Create a link in the continuous San Diego River Park Trail along the length of the river
- Maintain the same amount of active recreational space while providing additional opportunities for passive recreation
- Design for a sense of safety by maintaining wide open views
- Provide a connection from the river to Dusty Rhodes Park



Design patterns integrated with Robb Field and Dusty Rhodes Park

Selected Design Patterns, Materials, Forms and Colors

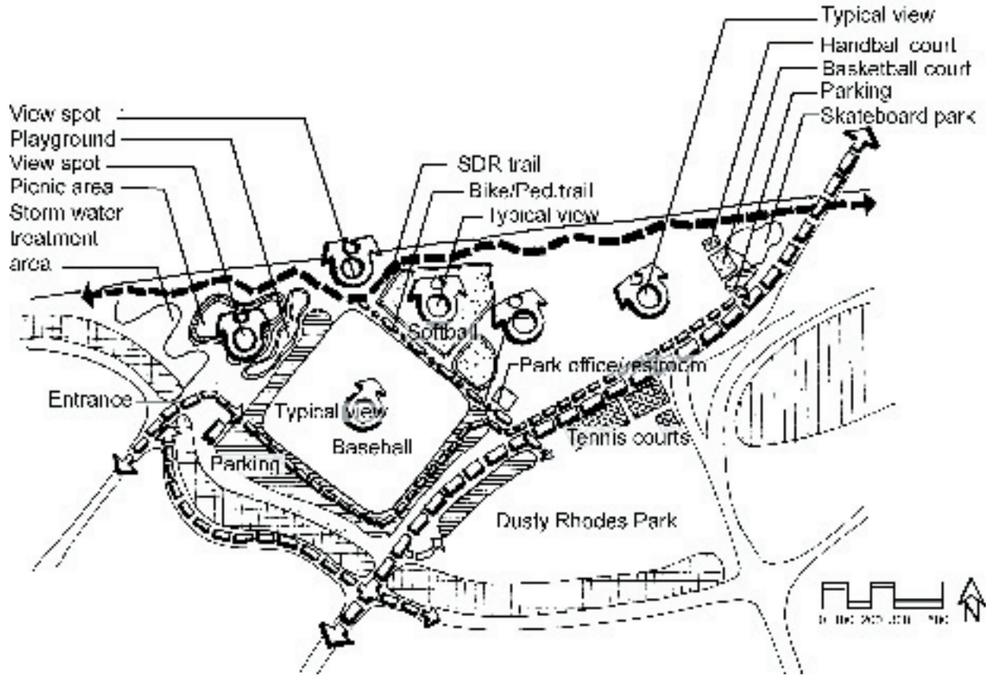
Design Patterns for use at this site were selected through an analysis of the Design Patterns appropriate to the estuary and the Design Goals and Objectives based the site context. The patterns chosen for use were: Infiltration Zones (W-3), Vegetated Swales (W-4), Stormwater Treatment Areas (W-7), Habitat Corridor (H-2), Native Landscaping (H-6), Access Points (P-1), Bicycle Facilities (P-2), Parking (P-4), San Diego River Park Trail (P-6a), Spur Trails (P-6b), View Spots (P-8), Kiosks (P-10), River Signage (P-11a), Directional Signage (P-11b), Interpretive Signage (P-11c), Regulatory Signage (P-11d), Lighting and Emergency Phones (P-12), Benches (P-13), Restrooms (P-14), Playgrounds (P-16), Picnic Areas (P-17).

Materials, forms and colors were influenced by the local aesthetics of the area and the chosen design patterns include sand and driftwood reflecting the ocean environment. Forms reflect the alluvial flow of an unchannelized river. Colors are washed hues and sky blue.

Design Concept

Reconnecting Robb Field to its surroundings, including the natural environment of the San Diego River and the adjacent Dusty Rhodes Park, while maintaining all existing activities within the parks, is the primary aim of this design. Robb Field's location adjacent to the estuary of the San Diego River provides an unexplored opportunity to recognize and celebrate the river. Located at the mouth of the river, this park could become a jewel of the river park system, a final river destination along a roughly twenty-mile park.

By opening up the riverfront of the park, park users will be able to appreciate and enjoy the river environment. The riverfront is currently lined with fenced-in tennis courts and parking lots, giving the impression that this is the back of the park. Moving the straight multiuse path inward and allowing it to meander alongside the river, will create areas where native Diegan coastal sage scrub vegetation can be reestablished along the river's edge. Pockets are formed where people can sit in the shade and admire the abundant waterfowl that congregate. Moving the tennis courts from where they currently screen out views of the river from the park, will open up wide views to the river from the heavily used recreational

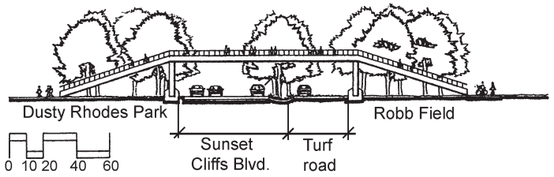


Proposed context of Robb Field and Dusty Rhodes Park

fields. Creating a pedestrian link between the parks with a bridge that can provide a landmark for the parks, will allow for easy access between the facilities, and will facilitate improved access to the river from local neighborhoods.

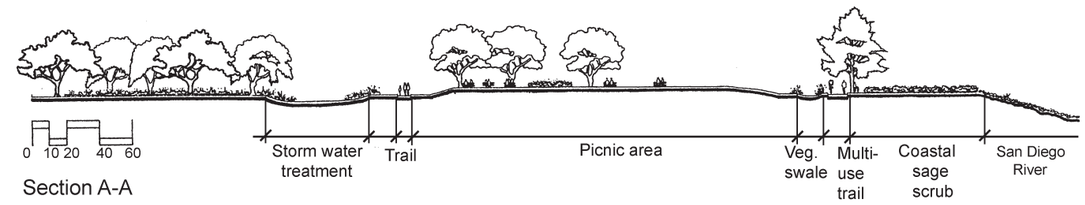
Another opportunity exists to not only recognize the parks connection to the river, but to also enhance it. A storm sewer runs under the northwestern corner of the park, releasing its urban runoff water directly into the estuary. If a portion of the drain water were allowed to flow along the surface in a reconstructed drainage, a stormwater treatment area could be developed in which urban runoff, locally polluted by contaminants such as fertilizers, pesticides, motor oil and gasoline, could be cleansed and filtered by natural vegetation. The area would not be large enough to cleanse and filter all the water from the stormwater sewer, but a portion could be directed into the treatment area, allowing bypass directly into the river during high intensity storm events. This area could then become the focus of a new family picnic area with views out to the river as well as to the recreational fields, and the public could be educated about the pollution found in stormwater runoff, its effects on the river environment, and techniques to reduce the contamination. Although its location within the floodplain requires the periodic removal and replacment of soils and vegetation to avoid concentrated pollution from entering the river in flood events, the high profile and public access to this site makes this demonstration project highly valuable.

Robb Field Recreation Center and Dusty Rhodes Park Site Redesign



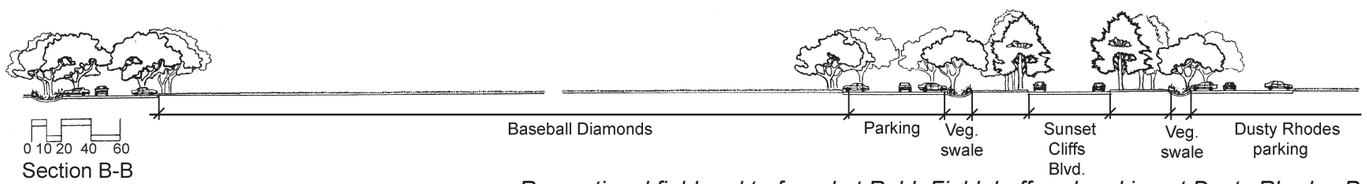
Section C-C

Pedestrian bridge to link the two parks



Section A-A

Stormwater treatment and picnic areas



Section B-B

Recreational field and turf road at Robb Field; buffered parking at Dusty Rhodes Park

Robb Field Recreation Center and Dusty Rhodes Park Design

The Robb Field, Dusty Rhodes Park redesign rearranges existing park activities and facilities within these parks to increase both riparian habitat and connections to the river. All existing activities are maintained within the two parks, and increased opportunities to enjoy the estuary are created.

The Robb Field park entrance from West Point Loma Boulevard will be improved with the addition of sidewalks and street trees. A new park sign, reflecting the coastal and riparian influences, marks the transition into the park.

Entering the park from the west, the San Diego River Park Trail, a paved twelve-foot-wide multiuse trail, meanders along the river edge, reflecting the natural water flow through the estuary. Shady pockets created by torrey pines along the meandering path provide increased habitat and also quite locations for bird watching and picnicking along the river's edge. Vegetated swales line the southern edge of the path, providing runoff catchment for the park.

On the northwest edge of the park, a new riparian environment and stormwater treatment area rich with western sycamores, willows, and native rushes creates a beautiful setting for picnicing while also serving to clean and filter the urban runoff. Interpretive signage, located along the streamside path, details how the filtration system works and highlights some of the park's native plants and wildlife. The adjacent picnic area, in a cool oak-shaded area, sits atop a low hill, providing views of the estuary and beyond. A planted area in the center is filled with flowering native shrubs. Playgrounds, located east

The water treatment area provides a great opportunity for the park users to learn about sustainable water treatment and the estuary's unique habitat

Families play at the riverfront playground

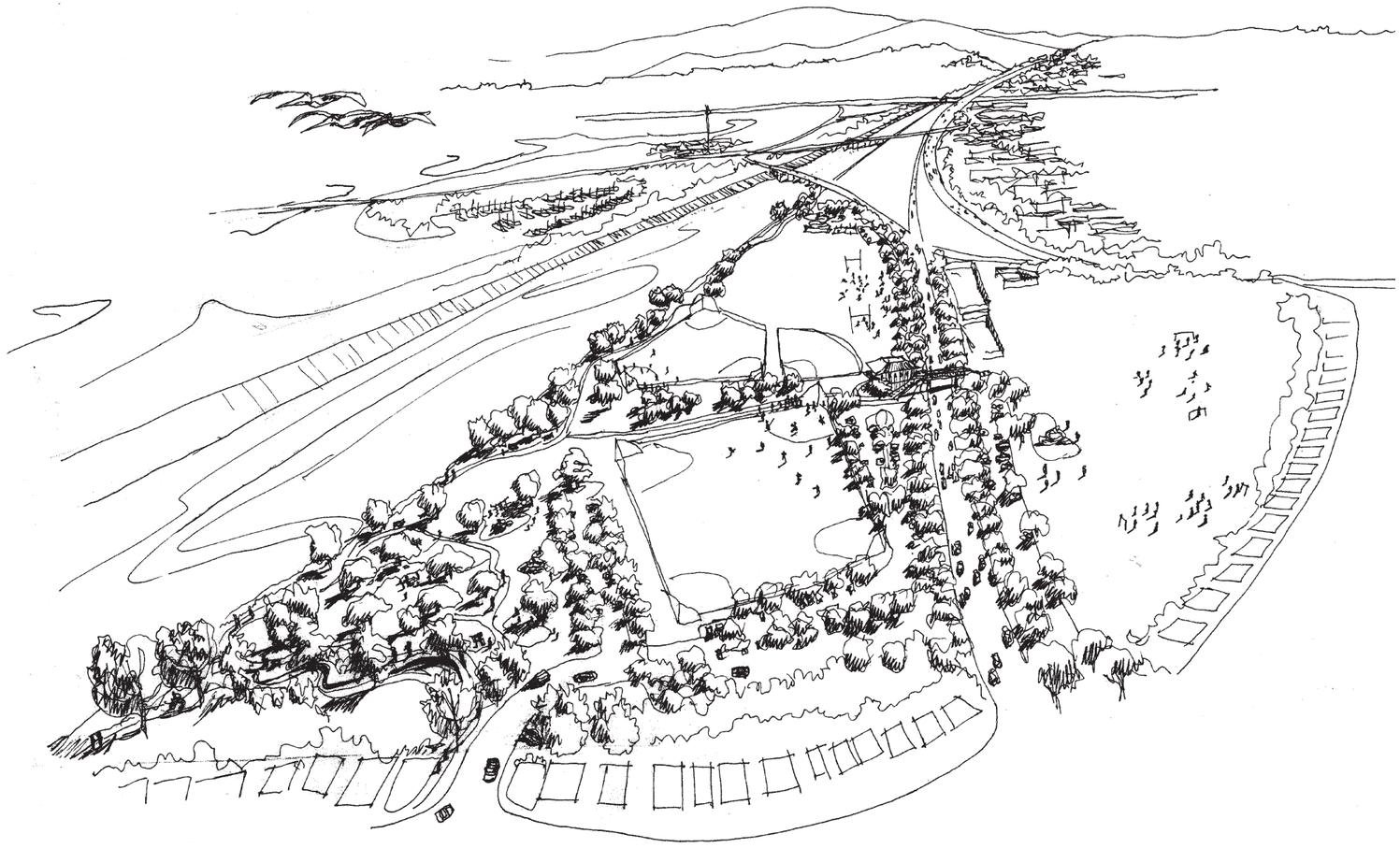
of the picnic area, provide ample play space for children of varying ages. Play equipment reflects the park's location by using organic forms reflective of the riparian and coastal environment.

Parking has been consolidated away from the river's edge into the southwest corner of the park, providing convenient access to picnicking, playgrounds, softball and recreational fields. Vegetated swales catch excess runoff from the compacted earth parking lots. A storage area is provided here for dumpsters with easy access to the park entrance.

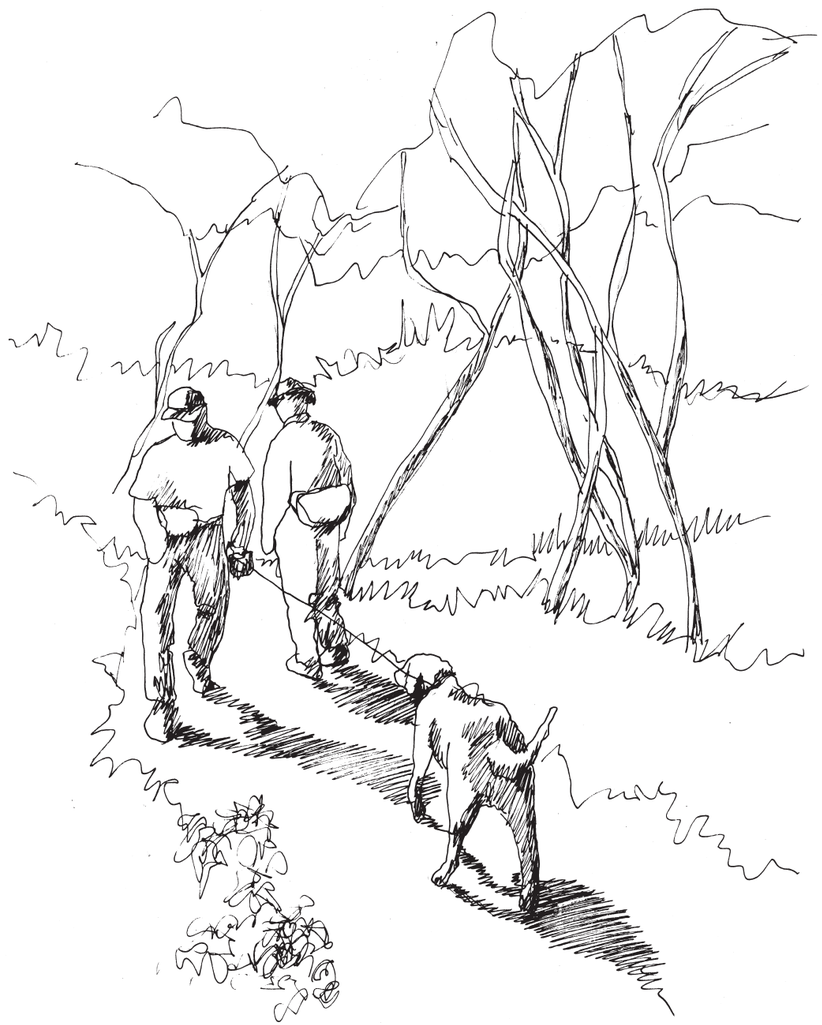
Exiting the southeastern parking lot corner, a green turf access road, reinforced with turf blocks to allow for automobile traffic, provides access to skate park parking. The green road, lined with torrey pines, also provides a buffer from Sunset Cliffs Boulevard. Skate facilities remain in their current configurations at the eastern edge of the park. Basketball and handball courts are located adjacent to the skate park.

The existing recreation fields have been opened up to the river through the relocation of the existing tennis courts, providing play areas with open views of the San Diego River. Adjacent to the open play areas, softball and baseball fields have been relocated, consolidating these activities into one central location. A two-story structure is proposed to provide park staff office space, fitness equipment and meeting facilities. The green roof structure will demonstrate improved infiltration strategies to the many park users. Eucalyptus trees removed to create new softball fields will be used to build benches for the park.

At this central location, pedestrian and bicycle access has been provided to Dusty Rhodes park via a new bridge. The bridge provides the opportunity of signage welcoming visitors to Ocean Beach and the two parks, and will provide a clear landmark along a busy traffic corridor. Dusty Rhodes Park has expanded parking, relocated tennis facilities, and plenty of turf areas for a wide range of activies.



Bird's eye view looking east at Robb Field and Dusty Rhodes Park



APPENDIX B: EVALUATION SUMMARY

Evaluation is an integral part of the design process, and occurs consistently throughout. Ideas are proposed and disposed, proposed and built upon and eventually finalized through continual cycles of evaluation. Many of these evaluations occur internally, as personal processes, or within the discussions of the design team, as design elements are held up to the standards of stated goals and objectives. The ideas put forward in this document have repeatedly undergone both personal and group evaluation, as well as evaluation from the 606 studio principals. This summary is intended to serve as a final check that this project has indeed accomplished the goals it set out to achieve.

CONCEPTUAL PLAN

The planning goals and objectives provide the most useful tool for evaluation; they were built from the more general project goals, community involvement and the San Diego's River context. As presented in Chapter Four, Conceptual Plan, they were:

To preserve and celebrate the river's historic resources

1. Develop partnerships with existing historical resources
2. Enhance preservation of historic and cultural resources
3. Facilitate education about the river's rich history

To support the natural stream processes of the San Diego River

1. Support sediment transport processes and manage erosion
2. Work toward decreasing river water volumes and increasing groundwater volumes
3. Improve water quality
4. Educate the public about how their actions impact the river environment

To preserve and enhance riparian habitat throughout the San Diego River Park

1. Enhance native habitat
2. Maintain and improve habitat connectivity throughout the park and maintain connectivity for bobcats in the upper reaches
3. Integrate recreation in such as way as to minimize impacts on sensitive species
4. Facilitate education about the river environment

To provide access to recreation and activities throughout the San Diego River Park.

1. Connect existing recreational facilities
2. Provide a continuous trail along the length of the San Diego River
3. Provide additional recreational opportunities and improve trail connectivity from the region into the river park
4. Maintain and improve the natural aesthetics of the river corridor
5. Enhance educational opportunities along the river

The following is a break down of how the conceptual plan components of River Park Framework and Design Patterns, and the three site designs, Cottonwood Grove Park, Mission City River Park, and Robb Field Recreation Center and Dusty Rhodes Park met the stated criteria.

The conceptual plan component of Recommendations provides reach specific information and guidelines for design, design patterns and character. The recommendations provide the details by which the components of River Park Framework and Design Patterns are applied within each reach. Because they guide the implementation of components to be evaluated, a break down of evaluation would be redundant and will not be presented here.

River Park Framework

The River Park Framework brings life to the community's vision for a connected and integrated river park. The framework expresses the goals and objectives of the park in a conceptual form in the following ways.

To preserve and celebrate the river's historic resources

1. Develop partnerships with existing historical resources: *Presents opportunities for partnershipe with Julian Historic District, Mission San Diego de Alcala State Historic Landmark, Old Town San Diego State Historic Park and Kuymeyaay Reservations for the preservation of historic village sites.*

2. Enhance preservation of historic and cultural resources: *Preserves and protects historic resources including the old wooden flume from Cuyamaca Reservoir, Mission Dam and Flume National Historic Landmark and Adobe Falls.*

3. Facilitate education about the river's rich history: *Proposes a Historical Interpretive Tour to provide educational opportunities to the public about the river's rich history*.

To support the natural stream processes of the San Diego River

1. Support sediment transport processes and manage erosion: *Provides oppor*

tunities to preserve the natural river character.

2. Work toward decreasing river water volumes and increasing groundwater volumes: *Creates opportunities to maintain impermeable surfaces in the park and to reduce runoff through the use of vegetated swales, protects the floodplain from development through the creation of a park.*

3. Improve water quality: *Provides opportunities to protect native vegetation, implement vegetated swales, and phytoremediation.*

4. Educate the public about how their actions impact the river environment: *Offers opportunities for public education by making natural processes visible within the park.*

To preserve and enhance riparian habitat throughout the San Diego River Park

1. Enhance native habitat: *Calls for coordinated habitat restoration throughout the park.*

2. Maintain and improve habitat connectivity throughout the park and maintain connectivity for bobcats in the upper reaches: *Maintains and improves a continuous habitat corridor and provides a bobcat corridor from headwaters to Mission Trails Regional Park.*

3. Integrate recreation in such as way as to minimize impacts on sensitive species: *Provides for buffers to prevent disturbances to sensitive species*

4. Facilitate education about the river environment: *Creates opportunities for the public to learn about restoration and native habitat and provides schools, colleges and universities opportunities to become involved in research.*

To provide access to recreation and activities throughout the San Diego River Park.

1. Connect existing recreational facilities: *Connects El Capitan Reservoir, El Monte County Park, Cactus Park, Santee Town Center, Mission Creek Park, Mast Park, Santee Lakes Regional Park, Mission Trails Regional Park, FISDRIP, Mission Valley Preserve, Presidio Park, Old Town San Diego State Historic Park, Robb Field Recreation Center, Dusty Rhodes Park and Dog Beach.*

2. Provide a continuous trail along the length of the San Diego River: *Provides the San Diego River Park trail along the entire length of the river park.*

3. Provide additional recreational opportunities and improve trail connectivity from the region into the river park: *Connects isolated trails in Santee, Mission Trails Regional Park, Mission Valley and the estuary and provides additional recreational resources affordably through combining multiple uses of historic preservation, water management and habitat preservation.*

4. Maintain and improve the natural aesthetics of the river corridor: *Protects and enhances the river corridor, thus maintaining the natural aesthetics.*

5. Enhance educational opportunities along the river: *Provides a regional connected system of parks and trails with uncountable educational opportunities.*

Design Patterns

Design Patterns provide the vocabulary to create the physical form of the river park. The goals and objectives of the park will be manifested through their application. Following is a list of design patterns that meet each of the stated criteria.

To preserve and celebrate the river's historic resources

1. Develop partnerships with existing historical resources: *Partnerships are not physical manifestations and are not included as part of design patterns.*

2. Enhance preservation of historic and cultural resources: *View spots (P-8), Interpretive signage (P-11c), Regulatory signage (P-11d).*

3. Facilitate education about the river's rich history: *View Spots (P-8), Interpretive signage (P-11c), Amphitheaters (P-18), Art (P-19).*

To support the natural stream processes of the San Diego River

1. Support sediment transport processes and manage erosion: *Stream meanders (W-1), Bank Restoration (W-2).*

2. Work toward decreasing river water volumes and increasing ground water volumes: *Infiltration Zones (W-3), Vegetated swales (W-4), Detention Basins (W-5), Retention Basins/ Wetlands (W-6).*

3. Improve water quality: *Vegetated swales (W-4), Retention Basins/ Wetlands (W-6), Stormwater Treatment Areas (W-7), Phytoremediation (W-8.)*

4. Educate the public about how their actions impact the river environment: *Interpretive signage (P-11c), Amphitheaters (P-18), Art (P-19).*

To preserve and enhance riparian habitat throughout the San Diego River Park

1.Enhance native habitat: *Habitat restoration (H-1), Sensitive species areas (H-5), Native landscaping (H-6).*

2. Maintain and improve habitat connectivity throughout the park and maintain connectivity for bobcats in the upper reaches: *Habitat corridor (H-2), Bobcat corridor (H-3), Wildlife underpass (H-4).*

3. Integrate recreation in such as way as to minimize impacts on sensitive species: *Habitat corridor (H-2), Bobcat corridor (H-3), Sensitive species areas (H-5).*

4. Facilitate education about the river environment: *View spots (P-8), Interpretive signage (P-11c), Maintenance centers (P-15), Amphitheaters (P-18), Art (P-19).*

To provide access to recreation and activities throughout the San Diego River Park.

1. Connect existing recreational facilities: *Bicycle facilities (P-2), Public Transit Access (P-3), Parking (P-4), Horse Facilities (P-5), San Diego River Park Trail (P-6a), Horse trails (P-6c), Road crossings (P-7).*
2. Provide a continuous trail along the length of the San Diego River: *San Diego River Park Trail (P-6a), Road crossings (P-7)*
3. Provide additional recreational opportunities and improve trail connectivity from the region into the river park: *Access points (P-1), Bicycle facilities (P-2), Horse facilities (P-5), Spur trails (P6b), Horse trails (P-6c), Road crossings (P-7), View spots (P-8), Water access (P-9), Benches (P-13), Maintenance centers (P-15), Playgrounds (P-16), Picnic areas (P-17), Amphitheaters (P-18), Recreational fields (P-20)* .

4. Maintain and improve the natural aesthetics of the river corridor: *Habitat restoration (H-1), Native landscaping (H-6), Art (P-19).*

5. Enhance educational opportunities along the river: *View spots (P-8), Interpretive signage (P-11c), Maintenance centers (P-15), Amphitheaters (P-18), Art (P-19).*

SITE DESIGN

Cottonwood Grove Park, Lakeside

This park provides the opportunity to demonstrate and test the practice of phytoremediation using native cottonwoods, while also serving as a gateway to the trails in the Lakeside portion of the river park. This site was identified through a community workshop as an opportunity for the river park.

The native cottonwoods used for phytoremediation may produce a large amount of cottonwood seeds that may be seen as a glorious spring event by some and as a nuisance by others. Opportunities exist to use this natural fiber for crafts, and a cottonwood festival could facilitate this appreciation. If community support of seed bearing species cannot be achieved, cotton-less cottonwoods which produce fewer seeds may be considered for use.

Following is a break down of how this park met the planning goals of the river park conceptual plan.

To preserve and celebrate the river's historic resources

1. Develop partnerships with existing historical resources: No opportunity to develop partnerships was available on this site.

2. Enhance preservation of historic and cultural resources: Echoes the agricultural heritage of the area through the use of a grid pattern for the cottonwoods in the design.

3. Facilitate education about the river's rich history: Engages in a natural water treatment process on land that was formerly used for mechanical water treatment.

To support the natural stream processes of the San Diego River

1.Support sediment transport processes and manage erosion: No opportunities existed at this site, river has been channelized in this area and mining pits are off site.

2. Work toward decreasing river water volumes and increasing groundwater volumes: Provides approximately thirteen acres of parkland preserving open space from development.

3. Improve water quality: Inexpensively cleans contaminated groundwater through phytoremediation and provides vegetated swales to filter on site runoff.

4. Educate the public about how their actions impact the river environment: Involves community monitoring in phytoremediation process and provides interpretive signage.

To preserve and enhance riparian habitat throughout the San Diego River Park

1. Enhance native habitat: Preserves existing riparian habitat, restores Diegan coastal sage scrub adjacent to the river.

2. Maintain and improve habitat connectivity throughout the park and maintain connectivity for bobcats in the upper reaches: Maintains a bobcat corridor along the river on site.

3. Integrate recreation in such as way as to minimize impacts on sensitive species: Provides for buffer areas adjacent to bobcat corridor with limited activities, develops horse trails appropriate to the needs of least Bell's vireo.

4. Facilitate education about the river environment: Provides interpretive signage at the view spot.

To provide access to recreation and activities throughout the San Diego River Park.

1. Connect existing recreational facilities: Connects a system of planned parks in Santee to a large proposed park in Lakeside.

2. Provide a continuous trail along the length of the San Diego River: Provides a portion of the San Diego River Park trail through the park.

3. Provide additional recreational opportunities and improve trail connectivity from the region into the river park: Provides a new access point, view spot, picnic area and connects to trails into the eucalyptus hills and down to the river.

4. Maintain and improve the natural aesthetics of the river corridor: Preserves and restores native habitat as well as creating the striking grid of beautiful native cottonwood trees.

5. Enhance educational opportunities along the river: Provides opportunities for education about water quality, phytoremediation and wildlife.

Mission City River Park, Mission Valley

This park provides numerous amenities to the Mission Valley community and is conveniently located adjacent to the public library, a trolley stop and Qualcomm Stadium. A maintenance center and nursery located adjacent to the trolley stop provides restoration facilities and educational opportunities. An enhanced storm drain creates a meandering stream environment. The strolling area provides trails for passive recreation and an amphitheater in an environment reflecting the river's natural channel. Replacing a portion of Qualcomm parking with turf for use as recreational fields and over-flow parking allows for increased groundwater infiltration and reduced heat island effect. All of these things occur in a park that is designed for natural, unavoidable flooding. The site of the strolling area and Qualcomm parking lot were both identified through a community workshop as an opportunity for the development of the river park.

This park facility will become a great asset to the many Mission Valley residents, providing many benefits on publicly owned, but currently inaccessible, land. The replacement of asphalt with turf in the Qualcomm parking lot creates a much more amenable environment by reducing the heat island effect for a variety of activities that occur in the parking area.

The turf playing fields on the Qualcomm lot will require irrigation, fertilizer and maintenance, but the opportunity to have much needed public recreational fields may justify these inputs. A turf area located where the strolling area is proposed will be replaced with native, drought-tolerant ground covers, requiring only drip irrigation during establishment.

Following is a break down of how this park met the planning goals of the river park conceptual plan.

To preserve and celebrate the river's historic resources

1. Develop partnerships with existing historical resources: No opportunity to develop partnerships was available on this site.

2. Enhance preservation of historic and cultural resources: Utilizes a tile mosaic in the entry plaza and amphitheater to invoke past history of the landscape.

3. Facilitate education about the river's rich history: Form of the park invokes images of the former floodplain, amphitheater provides opportunities for many educational activities.

To support the natural stream processes of the San Diego River

1.Support sediment transport processes: Naturalizes a concrete storm drain that flows into the river and allows it to meander, provides a park that is designed to withstand flooding.

2. Work toward decreasing river water volumes and increasing groundwater volumes: Decreases approximately fourteen acres of impermeable surface of Qualcomm Stadium parking lot and utilizes green roof on maintenance facility, resulting in over twenty two acres suitable for infiltration.

3. Improve water quality: Creates vegetated swales to clean and filter runoff along parking areas, trolley stops and road, naturalizes storm drain allowing it to be filtered naturally by riparian vegetation, utilizes trees with phytoremediation potential on site.

4. Educate the public about how their actions impact the river environment: Provides interpretive signage about the storm drain naturalization and the asphalt removal at Qualcomm

To preserve and enhance riparian habitat throughout the San Diego River Park

1.Enhance native habitat: Preserves existing riparian habitat, restores Diegan coastal sage scrub adjacent to the river.

2. Maintain and improve habitat connectivity throughout the park and maintain connectivity for bobcats in the upper reaches: Maintains a habitat corridor through the river onsite.

3. Integrate recreation in such as way as to minimize impacts on sensitive species: Provides for buffer area adjacent to habitat corridor with limited activities.

4. Facilitate education about the river environment: Creates opportunities for the public to learn about restoration and native habitat through the maintenance center and trolley stop interpretive signage.

To provide access to recreation and activities throughout the San Diego River Park.

1. Connect existing recreational facilities: Connects to a Qualcomm Stadium, a library and a shopping area.

2. Provide a continuous trail along the length of the San Diego River: Provides a portion of the San Diego River Park trail through the park.

3. Provide additional recreational opportunities and improve trail connectivity from the region into the river park: Provides public access and a large park facility on inaccessible public land.

4. Maintain and improve the natural aesthetics of the river corridor: Preserves and restores native habitat as well as creates the sculpted earth forms reflecting the river's natural flooding tendency.

5. Enhance educational opportunities along the river: Provides educational opportunities at the trolley stop, the maintenance center, the naturalized stream, the amphitheater, and Qualcomm parking lot athletic fields. Location adjacent to library enhances educational opportunities.

Robb Field Recreation Center and Dusty Rhodes Park, Estuary

Redesigning the very popular Robb Field and Dusty Rhodes Park in Ocean Beach is not without risk. Many people know and love these parks as they are, but the opportunities for enhancement are so great it could not be passed by. Redesigning the park to accommodate all existing activities while creating a connection to the San Diego River will improve the park experience for all users. The path along the river's edge was identified in a community workshop as an opportunity for design improvement. Stormwater treatment can be demonstrated, and habitat can be increased. This park, at the mouth of the river can become one of the jewels of the San Diego River Park.

This redesign provides many benefits to the local community. This park could become an even greater asset to Ocean Beach with the changes recommended. The location of the stormwater treatment area within the 100-year flood plain, where dredging of sediment and harvesting of plant material will be necessary is less than ideal. The high profile of this location and great opportunities for community education helps justify the increased maintenance.

Following is a break down of how this park met the planning goals of the river park conceptual plan.

To preserve and celebrate the river's historic resources

1. Develop partnerships with existing historical resources: No opportunity to develop partnerships was available at this existing site.

2. Enhance preservation of historic and cultural resources: No opportunities to preserve historic or cultural resources were available at this existing site.

3. Facilitate education about the river's rich history: Connects people with the estuary's historic meandering form by using it for inspiration to guide the placement of the riverside path.

To support the natural stream processes of the San Diego River

1. Support sediment transport processes and manage ersoion: The river is channelized through the estuary; no opportunities existed at this site.

2. Work toward decreasing river water volumes and increasing groundwater volumes: Provides infiltration areas by creating unpaved parking lots, a green turf road to the skate park parking and green roofs on new buildings.

3. Improve water quality: Provides a 1.2 acre stormwater treatment demonstration area to clean and filter the water of a storm drain that flows into the river, creates vegetated swales to clean and filter runoff along parking areas, trails, and roads.

4. Educate the public about how their actions impact the river environment: Provides a trail along and interpretive signage about the storm water treatment area.

To preserve and enhance riparian habitat throughout the San Diego River Park

1. Enhance native habitat: Restores native habitat along the channel edge.

2. Maintain and improve habitat connectivity throughout the park and maintain connectivity for bobcats in the upper reaches: Maintains a habitat corridor through the river on site.

3. Integrate recreation in such as way as to minimize impacts on sensitive species: Provides the lowest impact activities adjacent to the most sensitive estuary habitat.

4. Facilitate education about the river environment: Provides increased opportunities to view the natural habitat by creating view spots and benches between the river and bike trail, provides interpretive signage about the wildlife of the estuary.

To provide access to recreation and activities throughout the San Diego River Park.

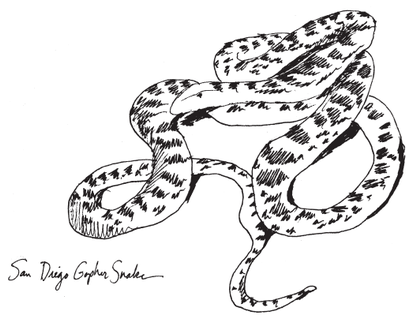
1. Connect existing recreational facilities: Connects the two recreational facilities of Robb Field and Dusty Rhodes to each other with a pedestrian and bicycle bridge and provides stronger connections to the river.

2. Provide a continuous trail along the length of the San Diego River: Enhanses an existing portion of the San Diego River Park trail through the park.

3. Provide additional recreational opportunities and improve trail connectivity from the region into the river park: Connects the two recreational facilities of Robb Field and Dusty Rhodes with a pedestrian and bicycle bridge, providing more convenient pedestrian and bicycle access from adjacent neighborhood.

4. Maintain and improve the natural aesthetics of the river corridor: Recognizes the river's presence at Robb Field by opening up the recreational fields to river views, replacing parking with recreational activities along the river edge, moving dumpsters from river edge to new parking lot, and creating a meandering path reflecting the river's natural state; utilizes native landscaping, preserves and restores native habitat.

5. Enhance educational opportunities along the river: Provides an important opportunity to educate the public about stormwater quality issues and how their actions affect the water quality in the estuary.



APPENDIX C

PLANNING DOCUMENTS FOR THE SAN DIEGO RIVER

City of San Diego

Atlas Specific Plan
Prepared for: Atlas Hotels, Inc.
Prepared by: P&D Technologies, Inc. (1998)

City of San Diego Multiple Species Conservation: Subarea Plan
Prepared for: City of San Diego
Prepared by: City of San Diego Community and Economic Development Department (1997)

Famosa Slough Enhancement Plan
Prepared for: City of San Diego and California Coastal Conservancy
Prepared by: Pacific Southwest Biological Services (1993)

First San Diego River Improvement Project: Natural Resource Mangement Plan
Prepared for: City of San Diego
Prepared by: City of San Diego Park and Recreation Department and Ogden Environmental and Energy Services (2000)

First San Diego River Improvement Project Specific Plan
Prepared for: City of San Diego
Prepared by: Multiple Consultants (1994)

Levi-Cushman Specific Plan
Prepared for: Chevron Land and Development Company
Prepared by: Unknown (1987)

Mission City Specific Plan
Prepared for: H.G. Fenton Company
Prepared by: T&B Planning Consultants (1998)

Mission Valley Community Plan
Prepared for: City of San Diego
Prepared by: City of San Diego Planning Department (1998)

Mission Trails Regional Park Master Development Plan
Prepared for: City of San Diego
Prepared by: The Reynolds Environmental Group (1985)

Navajo Community Plan
Prepared for: City of San Diego
Prepared by: Navajo Community Planners and City of San Diego (1982)

Proposed Mission City Parkway Bridge and Associated Facilities Draft Environmental Impact Report
Prepared for: City of San Diego Engineering and Capital Projects Department
Prepared by: City of San Diego Development Services (2002)

Mission Bay Park Natural Resource Management Plan
Prepared for: City of San Diego Park and Receration Department
Prepared by: City of San Diego Development and Environmental Planning Department (1990)

San Diego River Bike Path Feasibility Study: Ocean Beach Bike Path to Hotel Circle North
Prepared for: City of San Diego
Prepared by: Kimley-Horn and Associates (2001)

Temporary Paradise?: A Look at the Special Landscape of the San Diego Region
Prepared for: City of San Diego
Prepared by: Kevin Lynch and Donald Appleyard (1974)

Tierrasanta Community Plan
Prepared for: City of San Diego
Prepared by: City of San Diego Planning Department and Tierra Santa Community Council (1982)

Trails for San Diego
Prepared for: City of San Diego
Prepared by: City of San Diego Planning Department (1966)

City of Santee

City of Santee General Plan
Prepared for: City of Santee
Prepared by: Mooney-Lettieri & Associates (1992)

Santee Town Center Specific Plan
Prepared for: City of Santee
Prepared by: City of Santee Department of Planning and Community Development (1986)

County of San Diego

Construction Stormwater Best Management Practices for Soil Disturbing Activities
Prepared for: County of San Diego
Prepared by: County of San Diego Department of Public Works (2001)

County of San Diego Multiple Species Conservation Program Subarea Plan
Prepared for: County of San Diego
Prepared by: County of San Diego (1997)

El Capitan Golf Course Final Environmental Impact Report
Prepared for: Helix Water District
Prepared by: EnviroMINE (1999)

Examination of the Meteorological Assumptions Underlying the Derivation of the
Standard Project Flood for the San Diego River
Prepared for: San Diego Floodplain Technical Committee
Prepared by: Phil Pryde (1972)

RiverWay: A Specific Plan for the Upper San Diego River Improvement Project
Prepared for: County of San Diego
Prepared by: Brian F. Mooney Associates (2000)

San Diego County General Plan: Lakeside Community Plan
Prepared for: County of San Diego
Prepared by: County of San Diego Department of Planning and Land Use (2000)

San Diego River Habitat Conservation Plan
Prepared for: San Diego Associations of Governments (SANDAG)
Prepared by: San Diego Association of Governments (1990)

San Diego River Project Conceptual Master Plan
Prepared for: County of San Diego
Prepared by: County of San Diego and Wirth Associates (1983)

San Diego River Project Base Data Report Planning Report
Prepared for: County of San Diego
Prepared by: County of San Diego Parks and Recreation Department (1979)

San Diego River Project Draft Environmental Impact Report
Prepared for: County of San Diego
Prepared by: Wirth Associates (1983)

2020 Cities/County Forecast: Land Use Inputs
Prepared for: San Diego Association of Governments
Prepared by: San Diego Association of Governments (1999)

State of California

Water Quality Control Plan for the San Diego Basin (9)
Prepared for: State of California
Prepared by: California Regional Water Quality Control Board San Diego Region (1994)

San Diego County Flood Hazard Investigation
Prepared for: State of California
Prepared by: State of California Resources Agency, Department of Water Resources (1964)

Federal Agencies

An Archaeological Survey of the San Diego River
Prepared for: U.S. Army Corps of Engineers
Prepared by: San Diego State University Foundation (1975)

Evaluation of the Mission, Santee, and Tijuana Hydrologic Subareas for Reclaimed Water Use, San Diego County, California
Prepared for: U.S. Geologic Survey
Prepared by: County of San Diego and California Department of Water Resources (1985)

San Diego River (Mission Valley) Design Memorandum No. 1
Prepared for: U.S. Army Corps of Engineers
Prepared by: U.S. Army Corps of Engineers, Los Angeles District (1975)

APPENDIX D-1

PLANTS AND ANIMALS:

Sensitive Species

COMMON NAME	SCIENTIFIC NAME	HABITAT
MESA CLUBMOSS	*SELAGINELLA CINERASCENS*	CHAPARRAL, RIPARIAN
PROSTRATE SPINE FLOWER	*CHORIZANTHE PROCUMBENS*	COASTAL SAGE SCRUB, CHAMISE CHAPARRAL
SAN DIEGO SAGEWORT	*ARTEMISIA PALMERI*	COASTAL SAGE SCRUB
SAN DIEGO THORNMINT	*ACANTHOMINTHA ILICIFOLIA*	CHAPARRAL, COASTAL SAGE SCRUB
AMERICAN BITTERN	*BOTAURUS LENTIGINOSUS*	FRESHWATER WETLANDS, SHORELINES
AMERICAN PEREGRINE FALCON	*FALIO PEREGRINUS ANATUM*	MARSH, OPEN WATER, RIPARIAN, COASTAL SAGE SCRUB, GRASSLAND
BALD EAGLE	*HALIAEETUS LEUCOCEPHALUS*	CHAPARRAL, GRASSLAND, OTHERS
BURROWING OWL	*ATHENE CUNICULARIA*	GRASSLAND
CALIFORNIA GNATCATCHER	*POLIOPTILA CALIFORNICA*	COASTAL SAGE SCRUB
CALIFORNIA LEAST TURN	*STERNA ANTILLARUM BROWNII*	SALT PAN, BEACH
COOPER'S HAWK	*ACCIPITER COOPERII*	FORESTED RIPARIAN WETLAND, OAK WOODLAND, GRASSLAND
GOLDEN EAGLE	*AQUILA CHRYSEATUS*	COASTAL SAGE SCRUB, CHAPPARAL, GRASSLAND AND OAK WOODLAND
GRASSHOPPER SPARROW	*AMMODRAMUS SAVANNARUM PERPALLIDUS*	GRASSLANDS, RIPARIAN AND WETALND COMMUNTITES
LEAST BELL'S VIREO	*VIREO BELLI PUSILLUS*	RIPARIAN WOODLAND, OAK RIPARIAN FOREST
LEAST BITTERN	*IXOBRYCHUS EXILIS*	FRESH AND BRACKISH WATER MARSHES, DESERT RIPARIAN HABITATS
LIGHT-FOOTED CLAPPER RAIL	*RALLUS LONGIROSTRIS LEVIPES*	SOUTHERN COASTAL SALT MARSH
NORTHERN HARRIER	*CIRCUS CYANEUS*	SALTWATER MARSH, FRESH WATER MARSH, GRASSLAND
SHORT EARED OWL	*ASIO FLAMMEUS*	MARSHES, COASTAL PLAINS, PRAIRIES AND SAGEBRUSH
SOUTHWESTERN WILLOW FLYCATCHER	*EMPIDONAX TRAILLII EXTIMUS*	RIPARIAN HABITATS , OPEN WATER, CIENEGAS, OR SATURATED SOIL
SWAINSON'S THRUSH	*CATHRUS VOLTULATUS*	CONIFEROUS OR MIXED FORESTS, RIPARIAN WOODLAND
TRICOLORED BLACKBIRD	*AGELAIUS TRICOLOR*	GRASSLAND, FRESHWATER MARSH, RIPARIAN SCRUB
YELLOW-BREASTED CHAT	*GEOTHLYPIS TRICHAS*	RIPARIAN SCRUB, MARSHES, SCRUB, GRASSLAND
CALIFORNIA LEGLESS LIZARD	*ANNIELLA PULCHRA*	SAND DUNES, CHAPARRAL, SAGE SCRUB, RIPARIAN SCRUB
ORANGE-THROATED WHIPTAIL	*CNEMIDOHPORUS HYPERTHRUS BELDINGI*	FORESTED RIPARIAN, OAK WOODLAND, GRASSLAND, COASTAL SAGE SCRUB
SAN DIEGO HORNED LIZARD	*PHRYNOSOMA CORONATUM BLAINVILLIEI*	COASTAL SAGE SCRUB, CHAPARRAL, RIPARIAN SCRUB, GRASSLAND
SOUTHWESTERN POND TURTLE	*CLEMMYS MARMOROTA PALLIDA*	OPEN AQUATIC, FRESH WATER MARSH
TWO-STRIPED GARTER SNAKE	*THAMNOPHIS COUCHI HAMMONDII*	RIPARIAN HABITATS, OAK WOODLANDS
BOBCAT	*FELIS RUFUS*	WIDE RANGING
MOUNTAIN LION	*FELIS CONCOLOR*	WIDE RANGING
RINGTAIL	*BASSARISCUS ASTUTUS*	CHAPARRAL, RIPARIAN FOREST
MULTICOLORED DARNER	*AESHNA MULTICOLOR*	AQUATIC LARVAE, CARNIVOROUS ADULTS
VARIEGATED MEADOWHAWK (DRAGONFLY)	*SYMPETRUM CORRUPTUM*	AQUATIC LARVAE, CARNIVOROUS ADULTS
VIOLET DANCER (BLUET)	*CALIFORNIA ARCOLISTES*	AQUATIC LARVAE, CARNIVOROUS ADULTS
HARBISON DUN SKIPPER (BUTTERFLY)	*EUPHYSUS VESTRIS HARBISONI*	FOUND IN MTRP

SPECIAL NEEDS AND COMMENTS	LISTING STATUS
LIES PROSTRATE ON OPEN SLOPES	CALIFORNIA NATIVE PLANT SOCIETY LISTING
OPEN SANDY SOILS	CALIFORNIA NATIVE PLANT SOCIETY LISTING
UNDERSTORY SPEICES, BELOW 600M IN SAN DIEGO COUNTY	CALIFORNIA NATIVE PLANT SOCIETY LISTING
CLAY AND GABBRO SOILS	USFWS: CANDIDATE FOR LISTING, CDFG: ENDANGERED
TALL EMERGENT VEGETATION, VEGETATED FRINGES	CDFG: SPECIES OF SPECIAL CONCERN
WILL NEST ON CLIFFS, BUILDINGS AND BRIDGES	USFWS: ENDANGERED, CDFG: ENDANGERED
FORAGES IN WETLANDS AND MARSHES, NEEDS ADJACENT PERCHES	USFWS: THREATENED, CDFG: ENDANGERED
NESTS IN BURROWS IN THE GROUND	CDFG: SPECIES OF SPECIAL CONCERN
6 TO 45 ACRE HOME RANGES	USFWS: THREATENED, CDFG SPECIES OF SPECIAL CONCERN
UNDISTURBED SPARSELY VEGETATED FLAT SANDY AREAS	USFWS: ENDANGERED, CDFG: ENDANGERED
HUNT FROM LOW PERCHES	CDFG: SPECIES OF SPECIAL CONCERN
NESTS IN CLIFFS AND LARGE TREES	BALD EAGLE PROTECTION ACT, CDFG: SPECIES OF SPECIAL
NESTS LOW IN GRASSES, MOWING CAN BE SERIOUS THREAT	CDFG: SPECIES OF SPECIAL CONCERN
NESTS 3’ TO 4’ FROM GROUND ALONG THICKET EDGES	USFWS: ENDANGERED, CDFG: ENDANGERED
NESTS IN DENSE, EMERGENT VEGETATION	USFWS: CANDIDATE FOR LISTING, CAFG: SPECIES OF
REQUIRES ABUNDANT CORDGRASS HABITAT	USFWS: ENDANGERED, CDFG: ENDANGERED
FORRAGE 4 MILES FROM NESTING SITES	CDFG: SPECIES OF SPECIAL CONCERN
FORRAGE IN RIPARIAN CORRIDORS	CDFG: SPECIES OF SPECIAL CONCERN
WILLOWS AND COTTONWOODS	USFWS: ENDANGERED, CDFG: ENDANGERED
MIGRATES ALONG RIPARIAN HABITAT CORRIDORS	CDFG: SPECIES OF SPECIAL CONCERN
HABITAT EDGES	CDFG: SPECIES OF SPECIAL CONCERN
NEST ON OR NEAR THE GROUND	CDFG: SPECIES OF SPECIAL CONCERN
SAND OR LOOSE LOAMY SOILS,	CDFG: SPECIES OF SPECIAL CONCERN
DENSE VEGETATION FOR COVER, HIDES UNDER SURFACE OBJECTS	CDFG: SPECIES OF SPECIAL CONCERN
ROCKY OR SHALLOW SANDY SOILS	CDFG: SPECIES OF SPECIAL CONCERN
ROCKS ALONG WATER EDGES	CDFG: SPECIES OF SPECIAL CONCERN
ASSOCIATED WITH PERMANENT OR SEMI-PERMANENT BODIES OF WATER	CDFG: SPECIES OF SPECIAL CONCERN
MAY UTILIZE RIPARIAN CORRIDORS	TOP PREDATOR
REQUIRE LARGE RANGES FOR ROAMING	TOP PREDATOR, PROTECTED BY MORATORIUM ON HUNTING
NOCTURNAL, ELUSIVE	RARE
STILL PONDS, SLOW MOVING WATER, SEMI-AQUATIC	TOP INSECT PREDATOR
STILL PONDS, SLOW MOVING WATER, SEMI-AQUATIC	TOP INSECT PREDATOR, COMMON
STILL PONDS, SLOW MOVING WATER, SEMI-AQUATIC	TOP INSECT PREDATOR
CAREX SPISA IS SPECIFIC HOST FOR LARVAE, LOW TRICKLING WATER	CDFG: SPECIES OF SPECIAL CONCERN

Appendix D-2

PLANTS AND ANIMALS:

Community Descriptions

COMMUNITY	RIPARIAN	AQUATIC
TYPES	SOUTHERN RIPARIAN SCRUB	COASTAL VALLEY FRESHWATER MARSH ESTUARINE
	SOUTHERN RIPARIAN WOODLAND	DISTURBED WETLAND
	SOUTHERN COASTAL LIVE OAK RIPARIAN WOODLAND	SOUTHERN COASTAL SALT MARSH
	SOUTHERN COTTONWOOD-WILLOW RIPARIAN FOREST	INTERTIDAL
DESCRIPTION	WINTER-DECIDUOUS, DENSE, WATER-LOVING SHRUBS	FRESH, BRACKISH AND SALT WATER COMMUNITIES.
	AND TREES. SOUTHERN CALIFORNIA'S FALL COLOR.	IN WATER OR ALONG THE EDGES.
	ALONG WATER COURSES.	
PREDOMINANT PLANTS	COTTONWOODS (*POPULUS FREMONTII*),	FRESHWATER: CATTAIL (*TYPHA LATIFOLIA*),
	WESTERN SYCAMORES (*PLATANUS RACEMOSA*),	CALIFORNIA BULRUSH (*SCIRPUS CALIFORNICUS*).
	WILLOWS (*SALIX SPP.*),	BRACKISH OR SALT WATER: EELGRASS (*ZOSTERA MARINA*),
	WHITE ALDERS (*ALNUS RHOMBIFOLIA*),	CORDGRASS (*SPARTINA FOLIOSA*)
	MULEFAT (*BACCHARIS SALICIFOLIA*)	
ASSOCIATED WILDILFE	MANY INSECTS, AMPHIBIANS AND BIRDS INHABIT	AQUATIC RESOURCES DRAW VERY LARGE DIVERSITY OF
	RIPARIAN COMMUNITIES. RIPARIAN BIRDS SUCH AS	MIGRATORY AND RESIDENT BIRD SPECIES, SOME THAT
	LEAST BELL'S VIREO AND SOUTHWESTERN WILLOW	ARE RARE OR ENDANGERED INCLUDING LIGHT-FOOTED
	FLYCATCHER ARE ENDANGERED DUE TO HABITAT LOSS.	CLAPPER RAIL AND CALIFORNIA LEAST TURN. FISH,
	MANY OTHER BIRDS AND MAMMALS INCLUDING BALD	CRUSTACEANS, INSECTS, AND AMPHIBIANS

COMMUNITY	CHAPARRAL	COASTAL SAGE SCRUB	OAK WOODLAND
TYPES	SOUTHERN MARITIME CHAPARRAL	DIEGAN COASTAL SAGE SCRUB	DENSE COAST LIVE OAK WOODLAND
	NORTHERN MIXED CHAPARRAL		MIXED OAK WOODLAND
	CHAMISE CHAPARRAL		
DESCRIPTION	TALL, OFTEN IMPENETRABLE,	FRAGRANT, DROUGHT-DECIDUOUS LOW	EVERGREEN, BROAD-LEAF TREES WITH
	EVERGREEN SCRUB COMMUNITY	GROWING SCRUB COMMUNITY. ALLUVIAL	SCRUB AND GRASSLAND UNDERSTORY.
	ADAPTED TO LONG, DRY SUMMERS.	SOILS AT LOW ELEVATIONS.	DEEP SOILS IN CANYONS AND NORTH
	DRY SOUTH FACING HILLSIDES.		FACING HILLSIDES.
PREDOMINANT PLANTS	LAUREL SUMAC (*MALOSMA LAURINA*),	CALIFORNIA SAGEBRUSH (*ARTEMISIA*	COAST LIVE OAK (*QUERCUS AGRIFOLIA*),
	SUGARBUSH (*RHUS OVATA*),	*CALIFORNICA*), CALIFORNIA BUCKWHEAT	POISON OAK (*TOXICODENDRON*
	LEMONADEBERRY (*RHUS INTEGRIFOLIA*),	(*ERIOGONUM FASCICULATUM*), SAGES	*DIVERSILOBA*), TOYON (*HETEROMELES*
	CHAMISE (*ADENOSTOMA FASCICULATUM*)	(*SALVIA SPP.*), MONKEYFLOWERS	*ARBUTIFOLIA*), FUCHSIA-FLOWERING
		(*MIMULUS SPP.*)	GOOSEBERRY (*RIBES SPECIOSUM*)
ASSOCIATED WILDILFE	BIRDS ARE PREDOMINANT DIURNAL (DAY TIME)	SIMILAR TO CHAPARRAL SPECIES.	SMALL MAMMALS AND BIRDS THAT EAT
	SPECIES. INSECTS, REPTILES AND SMALL		ACORNS, SALAMANDERS, REPTILES,
	NOCTURNAL MAMMALS ARE NUMEROUS.		SNAKES AND MANY BIRDS ARE
	PREDATORS SUCH AS MOUNTAIN LIONS,		ABUNDANT. PREDATORS SUCH AS HUNT IN
	BOBCATS, GREY FOXES, COYOTES,		MOUNTAIN LIONS,BOBCATS, GREY FOXES
	HAWKS AND EAGLES HUNT IN THESE AREAS.		AND COYOTES THESE AREAS.

APPENDIX D-3

PLANTS AND ANIMALS

Invasive Exotic Plants Species

Arundo donax	giant reed
Brassica nigra	wild mustard
Chrysanthemum coronarium	giant chrysanthemum
Conzyza canadensis	horseweed
Cortaderia selloana	pampas grass
Cynodon dactylon	Bermuda grass
Eichornia crassipes	water hyacinth
Eucalyptus spps.	eucalyptus species
Fraxinus spps.	ash species
Hydrilla verticillata	hydrilla
Melilotus albus	white bee clover
Melilotus indicus	yellow bee clover
Nicotiana glauca	wild tobacco
Osteospermum fruiticosum	African daisy
Pennisetum clandestinum	kikuyu grass
Pennisetum ruppelii	pink fountain grass
Pennisetum setaceum	fountain grass
Phoenix canariensis	Canary Island date palm
Phragmites communis	common reed
Raphanus sarivus	wild radish
Ricinis communis	castor bean
Salsola iberica	Russian thistle
Schinus molle	California pepper
Schinus terebinthifolia	Brazilian pepper
Sonchus asper	sow thistle
Tamarix spps.	tamarisk species
Washingtonia spps.	Mexican and California palms

Based on FSDRIP Natural Resource Management Plan (2000)

APPENDIX E-1

COMMUNITY WORKSHOPS

Community Visions

At each of the community workshops, participants were asked to describe their personal "visions" for the river park. Participants called out their ideas for inclusion on a large visions list. At the completion of the excercize, participants were given two stickers to vote on their two favoirte visions for the river park. Following is a list of the visions and the vote count for each.

Visions gathered from the San Diego River Coalition on February 15, 2002

Cultural and historic features (3)
Recreation (6)
Natural park (5)
Clean water (4)
Habitat (4)
Historical (4)
Native vegetation (4)
Biking (3)
Educational facility (3)
Natural floodplain (3)
Wildlife (3)
Ecotourism (2)
Park versus preserve (2)
Remove concrete channels (2)
Volunteerism (2)
Wild and Scenic River (2)
Community asset (1)
Community bonding and focal points (1)
Compatible economic uses (1)
Contiguous (1)
Families (1)
Fishing (1)
Flood control (1)
Ground-water recharge (1)
Improve the watershed (1)
Kayaking (1)
Minimize edge effects (1)
Ownership (1)
Pedestrian walkways (1)
Picnics (1)
Preserve versus park (1)
Pride (1)
Relatively isolated (1)
Remove nonnatives (1)
Restore (1)
River sounds (1)
Stewardship (1)
Succession (1)
Tourist attraction/destination (1)
Tranquil (1)
Unconfined (1)

Visions gathered from the community meeting held in Mission Valley on February 21, 2002

User-friendly walking/jogging/bike/equestrian paths (10)
Abundant wildlife habitat (6)
Interpretive displays/historic (5)
Loop trail (4)
Preserve in tributaries (4)
Natural ecological/hydrological functions (4)
Preservation of Dog Beach (4)
Natural Park (4)
Remove exotics (plants) (4)
Cafes and shops (3)
Camping (3)
Canoe/kayak (3)
Ecotourism (3)
Flood control – no channel (3)
Reintroduce steelhead trout and other species (3)
Showcase alternative energy (3)
Tie rails/bike racks (3)
Balance of natural flow with safety (2)
Child-friendly education (2)
Open space (2)
Outdoor amphitheater (2)
Picnic areas (2)
Public transportation access (2)
Resort facility, hotel, B&B (2)
Restorations of mining (2)
River through time (2)
Run-off control/capture (2)
Water quality clean enough to swim in (2)
Call boxes (1)
Commercial sponsorship (1)
Connected (1)
Contemplative places (1)
Continuous and frequent accessibility (1)
Design for flood (1)
Different moods (1)
Disability access (1)
Dry season concerns (1)
Entry statement (1)
Fishing (1)
Geology/morphology made visible (1)
Groundwater (1)
Keep park feeling (1)
Leash free dog areas (1)
Lighting (1)
Maintenance of waterway (1)
Multi-cultural aspect (1)
Native American representation (1)
Unobtrusive W.C. (1)
Patrols (1)
Plant I.D. (1)
Pollution control (1)
Public art (1)
Safety (1)
Swallows (1)
User-friendly (1)
Viewpoints (1)
Visible waterway (all the way) (1)

Visions gathered from the community meeting held in Lakeside on February 28, 2002

Trail from El Capitan to ocean (12)
Senior/13-15 league baseball (12)
Riparian habitat (10)
Equestrian trails (9)
Interpretive trails (7)
Water clean enough to canoe (6)
Wetland restoration (6)
Roller hockey (5)
Environmental education (4)
Bike trails (4)
Abundant wildlife habitat (3)

Dedicated trails (3)
Historic markers/interpretive sites (3)
Historical building park (3)
Invasive/exotic free (3)
Open space between projects (3)
Water quality monitoring (3)
Continuous trees (2)
Natural and cultural center (2)
Natural area/narrow trails (2)
School programs (2)
Walkable community connectors (2)
Benches (1)
Clean/crime free (1)
Community garden (1)
Continuous riparian with core areas, no nonnatives (1)
Design standards (1)
Drinking fountains (1)
Fishing (1)
Fitness trail (1)
Lighting/passive (1)
Limit urban development (1)
Lookout spots (1)
Natural flood-plain (1)
Natural shade (1)
No asphalt trails/earth-based (1)
Offsite parking (1)
Picnic areas (1)
Quiet places (1)
School projects/community groups (1)
Small amphitheater (1)
Staging areas (unpaved) (1)
Strategic sanitary service (1)
Volunteer cleanup (1)
Volunteer patrols (1)

APPENDIX E-2

COMMUNITY WORKSHOPS:

Opportunities and Constraints

Summaries of input from the community meeting mapping exercises per reach. Many great opportunities and constraints were gathered for each reach of the river park. They have been consolidated to best communicate the input.

Headwaters

The opportunities that were expressed for the Headwaters include:

- Connect with the Trans County Trail at northern tip of El Capitan Reservoir
- Promote Wild and Scenic River designation, including Cedar and Boulder Creek
- Promote Wilderness proposal for Eagle Peak
- Become a field study area for community research
- Preserve the historic olive orchard along the river
- Connect to hiking destination areas such as Casa Grande Indian Mission and an oak woodland

The constraints that were expressed for the Headwaters include:

- Access is difficult because of extremely rugged terrain
- Negative impacts that occur by human access to remote areas such as Cedar Creek Falls

Reservoir to 67

The opportunities that were expressed for the reservoir to 67 Freeway include:

- Include the proposed trail connection from El Monte Park to Blossom Valley
- Provide a future trail from Lake Jennings to El Monte Park
- Run the river trail on the south side of the river with access points
- Collaborate with the new golf course
- Provide El Cajon Mountain connection
- Access the Flume Trail from river

The constraints that were expressed for the reservoir to 67 Freeway include:

- Access to El Capitan Dam
- Obstacles of accessing through the future golf course

Lakeside

The opportunities that were expressed for Lakeside include:

- Provide access to many possible connecting trails
- Provide trail access from Eucalyptus Hills to the river as well as fishing and equestrian access
- Protect the water supply of the Lakeside/El Monte Water District
- Obtain grants for restoration projects
- Reclaim and incorporating the sand mining ponds
- Run the river trail on the north side of the river
- Asphalt processing plant along San Vicente Creek

The constraints that were expressed for Lakeside include:

- MTBE contamination site south of river
- industrial pollution
- Homeless that inhabit river corridor areas
- Inadequate bridge across Wildcat Canyon
- Bridge will be necessary to cross at Channel Road
- Access through the 67 overpass
- Planned road encroachment on river
- Trails versus sand mining conflict
- No access from Riverford Road

Santee

The opportunities that were expressed for Santee include:

- Utilize the Town Center Park as an educational opportunity
- Acquire the vernal pools in Santee and linking them to the river park
- Purchase land for restoration in mining areas
- Provide trail access through quarries
- Provide trail connections to Santee Lakes
- Provide access through the golf course
- Provide trail connections to San Vicente Reservoir

The constraints that were expressed for Santee include:

- Homeless that reside near bridges
- Water quality issues from the water treatment plant
- Forrester Creek is 90% channelized

The opportunities that were expressed for Mission Trails Regional Park include:

- Connecting the trail runs through the park on the south side of the river to its adjacent areas
- The great inspiration that MTRP offers for the river park
- Provide trail access to Little Sycamore Creek
- Enlarge the equestrian trailhead at the parks eastern access point.

The were no constraints expressed for Mission Trails Regional Park.

Mission Valley

The opportunities that exist for Mission Valley include:

- Develop park between new mission valley library and the river at existing practice field
- Redevelop portion of Qualcomm Stadium for active recreation and future park use
- Connecting the river park to the Presidio Park and Old Town, Mission de Alcala and the Native American historic settlement to its east
- Transient problems near and underneath bridge structures
- Moving sewer line out of the river that exists from edge of MTRP to Admiral Baker Golf Course
- Incorporating the proposed trail from Admiral Baker Golf Course to 15 Freeway
- Restore the natural lowlands that exist just south of the Admiral Baker Golf Course
- Locate constructed wetlands or offline retention ponds for water quality improvements
- Remove concrete channel north of Alvarado Creek
- Use pervious surfaces
- Coordinate with Army Corps of Engineers to allow mitigation to be directed upstream for weed removal
- Provide a patrol
- Provide pedestrian access in Mission Valley Preserve
- Potential for a "natural park" in what is now the Mission Valley Preserve
- Provide trail access through the golf courses
- Add trees to Qualcomm parking lot
- Acquire the undeveloped land east of Town and Country with high restoration potential
- Acquire the land just east of the 805 freeway for the river park
- Cluster of riverside shops, cafes to evoke a sense of casual usage
- Promote shops to design towards the river, Friars Village on the south side of the river is a good place to start
- Install a hard surface trail from MTRP to Mission Bay for bicycle commuting
- Link to public transportation access
- Include child-friendly education
- Showcase alternative energy uses near Qualcomm Stadium
- Act as a pedestrian friendly link for hotel guests
- Provide access to backside of Qualcomm Stadium
- Provide access to Adobe Falls future park
- Install signage to river about the river at trolley stations
- Refurbish railroad bridge for pedestrian and bike crossing
- Bring active life to the river by allowing shops adjacent to trolley stops
- Expand trail through Levi-Cushman Specific Plan
- Clean-up water quality at Qualcomm Stadium
- Daylight the channelized Alvarado Creek

The constraints that were expressed for Mission Valley include:

- Active quarry south of MTRP
- Endangered species exist along corridor
- Federal golf course difficult to acquire land
- Golf courses not compatible with a river park
- Buildings are too close to the flood plain
- Traffic noise in general
- Need better access to cross major roadways in USDRIP
- 163 freeway is difficult to cross
- Safety concerns near Mission Valley Preserve
- Homeless people

Estuary

The opportunities that were expressed for estuary include:

- Make the area visually look like river
- Mimic the trail layout to the river's flow
- Encourage bicycling
- Access works well for bicyclists
- Add additional restrooms, benches and water fountains
- Install riverway signage (throughout river park)
- Improve parking at access to Ocean Beach
- Provide ocean education
- Allow horseback riding access on beach
- Fill and revegetate riprap
- Remove fill material from under the 5 Freeway bridge which is currently a truck parking lot
- Remove concrete channel
- Remove freeway and allow Famosa Slough to connect directly to the river
- Reconnect river to Mission Bay
- Extend trolley line
- Incorporate a boardwalk
- Install bilingual signage
- Interpretive signage regarding specific facts and tools for action
- Design a labyrinth for meditative walking
- Visually connect to Famosa Slough

The constraints expressed for the estuary included:

- Sea World expansion encroachment

APPENDIX E-3

COMMUNITY WORKSHOPS

Participants

February 15, 2002

Dorothy Leonard, Mission Trails Regional Park Foundation
Peggy Lacy, Friends of Mission Valley Preserve
Jane Donley, Friends of Dog Beach
Don Steele, Mission Trails Regional Park Foundation
Kathy Keehan, San Diego County Bicycle Coalition
Walter Odening, Tierrasanta Community Council
Dominic Gotelli, San Diego County Trails Council
R. Rierdan, San Diego River Park-Lakeside Conservancy
Pat Teaze, Friends of Adobe Falls
Deborah Jones, San Diego River Park-Lakeside Conservancy
Michael Beck, Endangered Habitat Legue, BCCT
Glenn Torbett, Sierra Club
Jim Harrison, San Diego Audubon
Jim Peugh, San Diego Audubon/Friends of Famosa Slough
David Kimball, Friends of Famosa Slough
Jo Ann Anderson, San Diego River Park Foundation/Lakeside Conservancy
Rob Hutsel, San Diego River Park Foundation

February 21, 2002

Cody Lofton, Mission Valley Community Council
Patty Schreibman, Mission Valley Unified Planning Commitee
Donna Gookin, San Diego Bicycle Coalition/Walkabout Knicker Bikers
Tim Frank, San Diego Urban Corps
John Bennett, SDC
Charlene Ayers
George Gonzalez, Ocean Beach Town Council
Kathie Satterfield, San Diego Audubon
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Marty Eberhardt
Andrea Bitterling, Helix Environmental Palnning
Steve Coblentz, Lakeside Trails
Lisa Gonzalez, Councilmember Donna Frye
Joy Frye, University of California, San Diego
E. Jarvis, University of California, San Diego
Shara Fisler, Aquatic Adventures
Pat Teaze, Friends of Adobe Falls
Marty Jones, San Diego Bicycle Coalition
Lori Saldana, Mesa College
Barb Ayers, Dog Beach Committee, Ocean Beach Town Council
Jason Lopez, San Dieguito River Park
John Deyenfelder, San Diego County Park Adventure
Arvie Deyenfelder
Melanie Kush, City of Santee
Geoffery Smith, Sierra Club

February 28, 2002

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Jerry Lester
Sara Lester
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Nathan Day, Lakeside National Little League
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Deborah Jones, San Diego River Park-Lakeside Conservancy
Patty Heyden, San Diego County Parks
Dan Krivitz
Ken Decker
Marie K.
Ron Scott
Jan Scott
Joyce Boeche, Lakeside Frontier Rider
Steve Atias
Barry O'Gorman, Lakeside National Little League
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John Bennett
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Michael Land
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Grace Terrazas, Cleveland National Forest
Cindy Burrascano, California Native Plant Society
Bill Bartleman
Lisa Mylan
Diane York, EHLH, Southern California Watershed Alliance
Gary Page, County of San Diego

George Gonzalez, Ocean Beach Town Council
Phil Pryde, San Diego Audobon Society
Vicki Touchstone
Larry Campbell, Helix Water District
Julie Bugbee
Mary Allison, Upper San Diego River Improvement Committee
Rick Lowe, Lakeside National Little League
Samuel Ayach, Lakeside National Little League
Tania Ayach, Lakeside National Little League
Cindy Denny, Lakeside Frontier Riders
Gail Sabbadinni, Lakeside Frontier Riders
John R. Stauffer

We would like to thank everyone for attending and participating in these workshops.

APPENDIX F

OPPORTUNITY ANALYSIS BY REACH

The matrix looks at the opportunities presented for historical recognition, water management, plants and anim-las and recreationa and education in each of the river's seven reaches. This suitability analysis helped to build the Design Recommendations portion of the Conceptual Plan.

		Headwaters	Reservoir to 67 Fwy	Lakeside	Santee	Mission Trails Regional Park	Mission Valley	Estuary
Historical Recognition	Kumeyaay Reservations	●						
	Large Parks	●				●		
	Developed Historic Sites	●				●	●	
	Kumeyaay Village Sites	●				●	●	●
	Agricultural History	●	●	●				
	Management	●	●	●	●	●	●	●
	Catalyst for Interest	●	●	●	●	●	●	●
	Transportation Route	●	●	●	●	●	●	●
	San Diego Infrastructure	●	●	●	●	●	●	●
	Hydrological Engineering	●	●	●	●	●	●	●
Water Resources	Free Flowing Portions	●	●	●	●	●	●	
	Mining Restoration		●	●	●		●	
	Permeable Surfaces	●	●	●	●	●	●	●
	Prevent Development	●	●	●	●	●	●	●
	Remove Non- Natives		●	●	●	●	●	●
	Facilitate Education	●	●	●	●	●	●	●
	Maintain Habitat	●	●	●	●	●	●	●
	Promote Management	●	●	●	●	●	●	●
	Vegetation Filters	●	●	●	●	●	●	●
	Promote Education	●	●	●	●	●	●	●
Plants and Animals	Habitat Protection	●	●	●	●	●	●	●
	Habitat Restoration	●	●	●	●	●	●	●
	Mining Restoration		●	●	●	●	●	
	Management	●	●	●	●	●	●	●
	Water Quality		●	●	●	●	●	●
	Habitat	●	●	●	●	●	●	●
	Bobcats	●	●	●	●			
	Horseback Riding	●	●	●	●	●		
	Decreased Disturbances	●	●	●	●	●	●	●
	Plants and Animals	●	●	●	●	●	●	●
	Disturbances	●	●	●	●	●	●	●
	Outdoor Laboratory	●	●	●	●	●	●	●
Recreation and Education	Existing Rec. Facilities	●	●	●	●	●	●	●
	Existing Trails	●	●	●	●	●	●	●
	Additional Rec. Facilities	●	●	●		●	●	●
	Additional Trails	●	●	●	●	●	●	●
	Schools, Colleges and Universities	●	●	●	●	●	●	●
	Interpretive Resources	●	●	●	●	●	●	●

APPENDIX G

PRESERVING FLOODPLAINS AS OPEN SPACE AMENITIES

By Leslie Redick

The Balance Between Nature and Floodplain

Rivers play a critical role in the development of our society. Our relationship with water through time has been one of dependence, abundance, and catastrophe. Dependence led to the early development of river flood plains as bases for agriculture and transportation. The abundance afforded by these river resources attracted more settlement and more structures were built in the flood plain. This settlement in the floodplain has reached the point in many parts of the world where a flood equals a catastrophe in loss of property and lives. How can we find the balance between floodplain settlement and natural river ecology? How do we manage suburban river corridors and strike a balance between ecological, recreational, and built systems? How can we sever the connection between the words flood and catastrophe?

These questions are particularly difficult when flood planning is attempted in an already developed flood plain. Furthermore, as landscape architects, what is our specific contributing role to the issue of flood management? Perhaps it is in looking at what has been done before in both structural and non-structural flood control, then subsequently looking forward with creative design solutions which take into consideration natural stream processes, water quality, recreation, safety, and protecting a sense of place.

Flood Management

Urbanization of the floodplain will continue and flood control will always be an issue. Consequently, the question becomes what form this flood control takes. There are two basic classifications of flood management, structural and non-structural. Structural modifications pertain to the protection of settled areas and quick removal of water, whereas non-structural modifications involve changes in human activity to accommodate the flood. Often times the two methods coexist. Many people forget that they live in a flood plain until it is too late and a flood has destroyed their home. Often the first reaction is to look for structural answers to abate the floodwaters.

Both structural and non-structural flood control practices are based on controlling the 100-year floodplain. This planning assumes that the numbers derived to estimate the 100-year flood are accurate and consistent. Unfortunately, in the arid southwest of the U.S., high precipitation does not necessarily equal a flood and most damage from floods occurs in cycles much shorter than 100 years.

Federal Guidelines for Insurance Zoning

The U.S. National Flood Insurance Program is based on the 100-year floodplain. The designated area is divided into the floodway, where most frequent flood flows occur, and the floodway fringe, an area which would receive light flooding in a 100-year flood. Buildings in the floodway are not eligible for insurance, but the fringe is allowable if the structures are flood-proofed. Yet, damage still occurs. The flood insurance program was designed as a way of curbing development in the flood plain, yet in a way it has opened the door for more by offering a false sense of security. Another choice in preventing development would be to rezone land. Often times it is too late to have property owners relocate and so engineering changes seem to be the next choice. Unfortunately these methods are expensive, ecologically damaging, and can exacerbate the problem.

Structural management

An engineered solution to flood control can take many shapes. Most often it is in the form of a concrete lined channel that straightens the meander of a river and is meant to increase the channel capacity and remove water from the site as quickly as possible. These channels have many unforeseen consequences. The channels alter flow velocities, in turn altering sediment distribution which affects invertebrates and fish. The removal of riparian habitat reduces organic matter and nutrient input as well as habitat diversity and cover. There is also a chance of an increase in water temperature that directly affects habitat on site and all the way down to the ocean.

Channel stabilization is another method of artificially strengthening stream banks against erosion. It can be done in many ways, including riprap with vegetation to reduce soil erosion, especially during floods. Although these structures may work well on site, they can trigger upstream and downstream channel adjustments that can increase flood hazards and sediment transport (Wohl, 2000).

These engineered solutions offer a quick fix, but unfortunately, floods, especially in arid climates, are unpredictable as to their timing and magnitude. Even an engineered flood control channel can overrun its banks. The channels provide a misleading sense of security that encourages human occupation of the floodplain. The Flood Control Acts of 1928 and 1936

were the first steps the government took to involve themselves in flood control. The U.S. Army Corps of Engineers was responsible for building reservoirs and channels along tributaries and primary river systems (Littleworth, '95). Despite these efforts, flooding continues to be a problem. In the last century, the rise in human population-density and rising land costs, as well as the sense of security from flooding as the result of new reservoirs and channels, have encouraged increased development in the flood zone. These developments expose more people and structures to flood damage. The encroachment of more structures into the floodplain leads to a loss in flood storage capacity, increasing velocity and flood elevation, and increasing peak flows downstream (Wohl, 2000).

Solving the flooding problem with structural methods creates many more problems in its wake. The riparian community of plants is greatly reduced, thereby reducing vital habitat for native animal species. Sediment is prevented from the flow that eventually leads to the development of beaches. So the money spent to channelize a river is spent again, further down the line, by having to dredge sand from the ocean floor to replenish the beaches. Groundwater recharge is also severely affected. Water is rushed out as quickly as possible, never given a chance to infiltrate, thus leading to groundwater depletion.

Non-Structural Management

Non-Structural flood control measures are also subject to unpredictability in their containment of floodwater. But philosophically, these non-structural methods are set up as prevention rather than cure. This approach comes with the attitude that we must adapt our lives to water fluctuations. No matter what we do, floods will be a part of life in the flood plain. Non-structural measures include flood proofing, land-use planning, soil bioengineering, warning systems, pre-flood mitigation efforts, and insurance. Until the 1970s, most flood loss reduction efforts were based on structural solutions. The shift presently has been to a mix of structural/non-structural methods.

One the best strategies for reducing property losses is through public acquisition of land. More than 30 years ago the U.S. established a cost sharing program for relocation. The properties are purchased with FEMA funding, and the Army Corps of Engineers has also purchased property that was left as open space. Land use control is one the most effective ways to prevent flood damage. A floodway left undeveloped through an urban area can be beautiful park asset.

Creative Design Solutions

In the past, improving rivers meant increasing their flow capacity. In the future, it should refer to the capacity of the floodplain to function as a visual amenity, a recreation area, a nature preserve, a storm detention area, and a movement corridor for humans and animals. Multi-purpose planning can help change the definition of the river into more than a channel for water. Flood risk can be managed by detaining storm water and letting it infiltrate, and vegetated roofs could decrease flooding, along with porous paving. Wetlands can also serve many ecological functions. Plants and aquatic life clean surface and groundwater, and reduce flooding by acting like natural sponges, storing storm water and slowly releasing it back to natural waterways. Wetlands also provide habitat and decrease the velocity of storm water that allows the sediments to settle out. Plants can synthesize organic pollutants such as oils and greases and use minerals from run-off for nutrients.

Innovative examples

Citizens of Denver have transformed a ten-mile derelict stretch of the South Platte River that runs through downtown Denver, into a park full of recreational opportunities, active and passive. As a result of a disastrous flood in 1973, more attention was brought to the flooding issue and a nine-member task force was set up to raise money for park projects. The Platte River Greenway, linking eighteen parks with fifteen miles of interconnected trails, is the result. When complete, the greenway will extend twenty-five miles north to the Rocky Mountains and twenty miles south to a state recreation area. Local communities were encouraged to develop trails along the greenway making the park a huge recreational resource while also providing habitat and flood control. All of the parks along the floodway are designed to resist flood damage, but also to provide flood storage. The efforts of both public and private organizations, and individual citizens, helped create this greenway. The Platte River Greenway Foundation funded and implemented the projects and then handed over management to the city's park department.

The Guadalupe River Park, another example of an innovative solution to flood control, is a three-mile ribbon of parkland currently being developed along the banks of the Guadalupe River in downtown San Jose. Efforts by the Friends of Guadalupe Park have contributed to the collaboration among government agencies and community interest groups to solve problems related to the Guadalupe River Flood Control project. The park provides an integrated approach to providing flood protection, habitat cre-

ation, and recreational opportunities. The landscape architecture firm of Hargreaves and Associates is currently designing the park. It is meant to be an example of a modern flood control project integrated with a major recreation park and wildlife habitat. The river park plan consists of a grading plan for the flood control channel which includes undulating terraced banks and landforms, obviously manmade, as a backbone to the natural riverbank landscape. The lower section of the park is meant to serve as a flood retention basin.

The Indian Bend Wash Flood Control Project located in Phoenix, Arizona took on a major enhancement project with the Salt River. This project aimed to limit development in the floodplain. The concept for the plan was to confine the flood to its natural path with structural elements and then enrich the natural path with golf courses, trails, picnic areas, ball fields, and other recreational features. The wash was designed to safely handle the 100-year flood. At the core of the project is a greenbelt which runs through Scottsdale. The channel conveys flood flows through Scottsdale to the Salt River. The project was designed and constructed by the U.S. Army Corps of Engineers.

Institutional Involvement in Flood Control Restructuring.

In 1998 the U.S. Army Corps of Engineers began to focus on more sustainable approaches to flood control. The Corp's claims are: "Through its focus on nonstructural alternatives to flood protection, it will move families and businesses out of harm's way and strive to return the floodplains of rivers and creeks to a condition where they can naturally moderate floods as well as provide other benefits to communities and the environment"(Wohl, 2000).

"The United States is coming to appreciate the full significance of the fragile ecosystems that border rivers. When development takes place in flood plains, when river channels are straightened, and when locks and dams are built, wetlands and aquatic habitats are eliminated and species are lost" (Littleworth). Flood plains make an important contribution to regional open space networks. Zoning of these areas should be as agriculture and open space to best preserve the natural river ecology and the safety for the communities on the fringe.

"The maintenance of the regional setting, the green matrix, is essential for the culture of cities…" (Spirn) Riverbeds in their natural state represent the resolution of many forces. The changing edges of the channel and the flow patterns hold great significance. The visible effects include runoff control, sediment deposition and flood control. The less visible affects of infiltration and transpiration hold just as much importance. When disturbed in any way, the balance is thrown off and usually has negative affects on communities downstream. Improvements to river systems may be necessary in urban settings. These changes should only be made with a thorough understanding of the future effects upon the ecosystem.

The Wisdom of Non-structural Solutions

Reservation of floodplain lands as open space corridors and wildlife habitat, bank stabilization by replanting with native riparian species, and bed stabilization by restoration of a pool-riffle sequence are all examples of nonstructural approaches to flood hazards that benefit river ecosystems and, in the long run, are economically more viable than traditional river engineering. All of these nonstructural elements could be incorporated into a river park that could serve as a source for rejuvenation of the local community and for the river itself.

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APPENDIX H

DESIGNING RIPARIAN CORRIDORS FOR BIODIVERSITY

By Sarah Easley

Introduction

Biodiversity can be described as the diversity of living things and their life patterns and processes. More specifically, it is defined as the diversity of species, ecosystem structures and ecosystem functions; it includes the diversity of life at all scales, including genetic, species, population, ecosystem, landscape and region. Biodiversity on earth has fluctuated through time, and periods of extinction have been followed by periods of expansion. Today, however, the rate of extinction is approaching an all time high, and it is human activity that accounts for most modern species loss (Grumbine, 1992).

The magnitude of the global loss of biodiversity is one of the most significant environmental issues of our time. Our planet's biodiversity is an irreplaceable resource, providing adaptability for an uncertain future. Loss of biodiversity is occurring in areas all over the world, and America is no exception. Our sprawling, land-intensive patterns of urban and suburban growth have lead to inevitable conflicts between development and habitat. The potential for loss of our biodiversity increases as habitat become increasingly isolated and fragmented (Beatley, 1994).

This loss and isolation of habitat is the most serious threat to global biodiversity today, and in our modern world, it seems to be an unstoppable phenomenon (Collinge, 1996). But if the reduction of biodiversity is to be slowed or stopped, this issue must be addressed. Fragmentation, dissection, perforation, shrinkage and attrition are all ways in which habitat areas can be lost or isolated over time. In the face of these pressures, it becomes increasingly important to provide landscape connectivity (Hansen and di Castri, 1992). Habitat corridors provide one means of maintaining these connections (Collinge, 1996), and a growing empirical body of knowledge is showing the many benefits of high quality linkages, such as biological corridors, between habitat patches (Dramstad et al., 1996).

A biological corridor can be defined as a strip, swath or other functional habitat that allows species to move between otherwise isolated patches (Grumbine, 1992). Riparian corridors are among the most basic of corridor types. Even in the undeveloped landscape, riparian corridors facilitate the movement of many species, while in the developed landscape, this function becomes even more critical. With increasing numbers of tributaries in the system, the size of the riparian network increases, as does the ecological integrity. An ideal riparian network contains the habitat corridors of a river or stream and all of its tributaries linked together through a self-sustaining water system (Marsh, 1998).

Stream corridors offer exceptionally diverse environments, and often support the highest species richness in a given landscape. Especially in dry areas, the riparian corridors can be seen as a linear oasis, containing high numbers of rare species. Besides providing habitat to riparian species, these areas also provide water, food or shade to many species in the surrounding habitat matrixes (Forman, 1999). Beyond biodiversity, these corridors play major roles in protecting the integrity of riparian processes by controlling water and minimizing nutrient flows (Forman and Godron, 1986).

The planning and design of riparian corridors is complex and challenging with many factors that must be considered for successful establishment. Through careful design, however, riparian habitat corridors can help maintain regional biodiversity and sustain natural riparian processes in a future increasing land development.

Riparian Habitat Corridors in the Urban and Suburban Setting

Corridors are most likely to be established in rural settings, which is especially important when those areas are anticipated to be developed. However, their identification and preservation in urban and suburban areas can provide important linkages to habitat areas in more rural settings. These corridors in developed areas should be designed and managed with special attention to discouraging human harassment of wildlife and to providing adequate width for wide ranging species (Smith and Hellmund, 1993).

In many urban and suburban landscapes, riparian corridors have been left undeveloped by default, because of their natural tendency for flooding. Remnant natural systems, unbuildable stream corridors, empty lots and unmanicured properties, provide refuge for many native species in the built environment. It is these remnant pieces that may form the basis to bring natural processes back into urban and suburban environments (Hough, 1995). These accidental remnants though often significantly altered by human activities, can be highly valuable habitat if managed and preserved properly (Gilbert, 1989). Riparian areas have rich alluvial soils and

associated high biological diversity. They often provide moderated microclimates due to the presence of shade and water. Abundant insects and plants are available to feed wildlife, and tree cavities and dense growth can provide shelter for birds and mammals.

The density of vertebrate species is especially high in riparian landscapes in comparison to surrounding habitats. This is particularly true in the arid southwest where riparian areas are often the sole low lying landscapes with native trees and tall shrubs. Many plant and animal species are riparian obligates, that is they are found only in riparian areas. In Southern California, many of these species are rare or endangered due to increasing human development, and so conservation of riparian land becomes increasingly important (Smith and Hellmund, 1993).

Function of Riparian Habitat Corridors

Habitat corridors and riparian habitat corridors have been used as tools for biodiversity conservation since the 1970s. Corridors provide two key biological functions that enhance biodiversity: conduits for movement, and dwelling habitat for plants and animals (Smith and Hellmund, 1993).

Riparian corridors as conduits for daily and seasonal movements are important to a wide range of species, allowing animals to move through the landscape in relative safety to find food, water, cover, and potential mates. These corridors may be used regularly by species, or in times of need, such as in times of drought when upland species move into lower wetter areas. Many species, including birds, tend to move along vegetated corridors that provide shelter and refuge from stalking predators.

Riparian corridors provide for dispersal when animals or plant seeds travel between populations and when genetic material flows between populations through breeding. Population isolation and inbreeding causes a loss of genetic diversity and a decline in population health over time. Dispersal is essential to the maintenance of healthy populations, particularly in fragmented landscapes.

At larger scales, habitat connectivity through corridors can help protect species from the effects of landscape and climate changes by allowing for migration to more suitable locations. Without such connections, isolated species have the potential of being trapped in unfavorable environments where their survival is uncertain. Generally, the diversity of wildlife in an area can be described as proportional to the available length of routes (Lyle, 1999).

An obvious advantage of corridors is the simple fact that they protect natural areas and provide dwelling habitat for plants and animals, as do other types of preserves. Riparian corridors are especially important because, within a small area, they can protect a variety of habitats including aquatic, riparian and upland communities. These areas also tend to contain high biological diversity for their relative size (Smith and Hellmund. 1993).

In addition to benefits to biodiversity, riparian corridors offer a wide range of benefits to stream health and water quality. The quantity and timing of stream flows, know as hydrologic regulation, is significantly influenced by the presence of riparian corridors. Vegetation, wetlands and flood plains all contribute to the slowing and dissipation of flood waters. Erosion and sediment control is better balanced in vegetated corridors due to the stabilizing effects of plant roots, and excess nutrients can be filtered out by the presence of riparian vegetation. Water temperatures are also moderated when shade is provided, resulting in benefits to the aquatic habitat. These improvements in stream health, flooding potential and water quality can have a positive effect on the landscape as a whole beyond the boundaries of the corridor itself.

Design Strategies for Urban and Suburban Riparian corridors

It cannot be assumed that a given riparian corridor will be beneficial to native biodiversity. Preserved habitats will meet the living and dispersal requirements of some species but not of others. In some cases, weedy and invasive non=native species may benefit from the presence of a corridor. Corridors must be designed with careful consideration to the goals and biodiversity issues of the given design. Is the design to benefit one or more particular species that may be threatened or rare, is the design to benefit particular habitat types? Is the design to benefit the dispersal of species through the landscape or is the design to serve a combination of purposes? These questions must be addressed specifically and carefully in each design project, and detailed knowledge of the ecosystems involved is necessary.

Corridor design should not be allowed to substitute for the preservation of whole, intact nature preserves. Corridors serve a particular function, but cannot replace the value of continuous habitat (Collinge, 1996). Likewise, corridor establishment should not divert attention from the view and management of the landscape

as a whole. Corridors can be essential pieces of regional management strategies, providing much needed connectivity, but they cannot, by themselves, be an entire conservation strategy (Smith and Hellmund, 1993).

Design Strategies: Alignment

When designing riparian corridor alignment, the placement of the corridor through the landscape, many concerns should be kept in mind. Whenever possible, the waterways and the adjacent waterway-influenced lands on each side should be preserved within the corridor. All tributaries within the watershed ideally will be included, and if they cannot, the tributaries should be ranked and chosen for inclusion according to the impact or potential impact of adjacent land uses. This will ensure higher water quality within the waterway and provide additional connectivity. Connectivity of corridors to surrounding habitat patches is a critical issue. High priority needs to be given to the protection of nodes, such as where tributaries meet the waterway, as these are critical links in the stream network for animal movement. High priority should also be given to areas where habitat patches connect, as well as areas with high levels of biodiversity or sensitive species.

Also of primary importance to the design and management of riparian corridors is native biological diversity. The needs of species sensitive to fragmentation and human disturbance will need to be examined relative to the needs of invasive exotic species that tolerate or thrive in human landscapes. When management of a particular species is the goal, the minimum planning unit should be the minimum area required to ensure genetic survival of the species. This area can be determined by population studies, and planning at smaller scales will have little or no impact on the species viability.

When alternatives are available, the alignment of a corridor should be carefully considered, as the alignment selection is critical to the future functioning of the corridor. Habitat patches that were linked in the past should be connected with corridors of similar habitat. Habitats whose species are sensitive to fragmentation should be linked, while connections to habitats that have been artificially disturbed or are dominated by weedy species should be avoided. A range of habitats should be included in a corridor while maintaining continuity of habitat for any species of concern to the project. Continuity of habitats with native vegetation should be included to encourage the movement of native species within the corridor. Naturally existing movement corridors, including riparian areas, should be located and maintained whenever possible. A network of redundant corridors providing multiple linkages between habitat patches is ideal, while long stretches of corridor without significant nodes of high quality habitat should be avoided, unless the corridor is very wide. Finally, roads and other potential barriers to movement should be avoided within the corridor, and if present, strategies must be developed to compensate for the loss of connectivity (Smith and Hellmund, 1993).

Design Strategies: Width

Many considerations should come into play when designing corridor widths. Habitat corridors should be wide enough to minimize edge effects and to encompass as much interior habitat as possible. The necessary width should be determined for the most sensitive species, considering its tolerance to edge effects and disturbance. The maximum amount of high quality habitat for the most sensitive species should be included within the width. Where possible, the interior habitat areas should be wide enough to accommodate for natural succession after disturbances.

In the creation of riparian corridors, it is important to understand the impact of surrounding land uses on the stream and riparian community integrity, and to use this knowledge as a basis for corridor design. The target stream's geomorphic floodplain, the riparian forest, wetlands, and the stream's shallow groundwater system should also be included. Other critical areas to include, if possible, are intermittent tributaries, gullies and swales, aquifer recharge and discharge areas, adjacent slopes, and erosion areas. Widths should be adjusted to account for the impacts of adjacent land uses. Wider corridors should be used in areas with high-impact adjacent uses, such as for intensive agriculture or dense housing developments (Smith and Hellmund, 1993).

Corridor widths need to be determined on a site by site basis with the consultation of a qualified wildlife biologist, but an examination of a local case study can give estimates of appropriate distances. Currently in the process of being implemented, a wildlife corridor for bobcats, mountain lions, gray fox, coyotes and badgers in the rapidly urbanizing lands between the Santa Monica Mountains and Santa Susana Mountains on the western edge of the city of Los Angeles, California recommends minimum corridor widths of 15,000 feet for short spans. Across spans of one-quarter mile or more, widths are recommended to be even greater. Wildlife underpasses as narrow as sixteen feet wide and 170 feet long are, however, included in the corridor and

regular bobcat use has been documented in these (Smith and Hellmund, 1993).

Design Strategies: Site Scale Biological Issues

In smaller scale design within the corridor, it is necessary to plan and manage for native vegetation preservation and/or restoration within the corridor, with emphasis on habitats used by the most sensitive species. Invasive exotics and weedy species should be carefully controlled and eliminated if possible. Ongoing management strategies for this may be necessary. Care should be taken to maintain a diversity of vegetation heights to provide a variety of habitat types, if ongoing vegetated management, such as trimming, is necessary. Practices such as mowing should be strictly avoided. Narrow corridors, with limited interior habitat areas, should be managed to encourage as much vegetated diversity as possible.

In situations where roads or other transportation right-of-ways bisect the corridor, careful attention should be given to wildlife crossing alternatives. Tunnels, underpasses or other wildlife crossings should be developed with the behavior of the most sensitive animal species using the corridor. The width of such structures depends on the size and behavior of the sensitive species. For example, a three-foot tunnel may be sufficient for amphibian crossings, where as a quarter-mile wide underpass would be best for large animals. Fences or other barriers can help to tunnel animals into the desired crossing areas and to prevent them from crossing at undesirable locations. Careful research into the behavior of targeted species is necessary for adequate design standards of any wildlife crossing structure.

Consideration should be given to the question of livestock access within riparian corridors. Livestock should be excluded from riparian areas when possible. When this is not possible, they should be limited to short segments and contained to one side of the stream to reduce impacts. Riparian areas are often seen as recreational opportunities for local communities, and equestrian access is often an issue. Consideration should be given to the tolerance of the most sensitive species to the presence of horses, and if their presence is deemed appropriate, trail design should avert equestrians from sensitive areas. Additional maintenance and management may be necessary to control invasive species due to increased disturbances.

Riparian corridors, because of their linear nature, are open to invasion by many nonnative or aggressive species. In urban and suburban areas, domestic dogs and cats can prove devastating to some native species, especially low nesting birds. Fencing and neighborhood education are two ways to alleviate this situation. Certain opportunistic mesopredators such as jays, crows, cowbirds, raccoons and skunks can thrive in corridors due to their preferences for edge habitats. When this is a foreseeable problem to sensitive corridor species, corridor width should be adjusted to increase interior habitat areas. When this is not possible, species-specific conservation practices, such as providing predator protected habitat areas, may be necessary to alleviate predation pressures (Smith and Hellmund, 1993).

Design Strategies: Site Scale Human Issues

Human access becomes an important consideration in urban and suburban riparian corridors. Habitat areas in developed settings can provide much needed space for exercise, refuge and recreation. In dense urban areas with inadequate open space, it can be impossible to prevent people from utilizing these areas. It becomes important, therefore, to carefully plan for human presence to provide a safe environment for people and to reduce the impacts to sensitive corridor species.

When recreation is planned for within the corridor, all necessary requirements for public safety and access must be met, and a sound human safety program should be developed. Liability issues should be carefully considered and legal consultation is advised. For protection against litigation, an organization should have a well thought out maintenance and risk management program, adequate liability insurance, and a good knowledge of local recreation laws and recent case histories. Nonprofit organizations interested in developing or managing habitat corridors with recreational components should consider partnering with a government owner, such as a parks department to assist with legal responsibilities (Flink and Searns, 1993).

Designing appropriate areas for recreational access plays a key role in reducing potential negative impacts to habitat. Facilities such as trails, access points and picnic areas should be located and designed with regard to both ecosystem sensitivity and anticipated recreational uses and types. Centers of activity such as parking lots, large picnic areas and visitor centers should be located on the edges of protected areas and in locations that are both durable and central. A system of zones should be established based on the sensitivity of the landscape, with highest impact activities allowed in the least sensitive zones.

Trail routes should be planned to avoid habitats preferred by sensitive species. Spur trails off main routes can provide access to sensitive areas when deemed appropriate. Off trail use should be discouraged by designing trails that access the locations people desire, building trails that are well-defined and of adequate width and surfaces for intended uses, and educating visitors about trail routes and the impacts of off trail use. Dense vegetation, logs and routing trails through rough terrain are preferable to fencing and signs to keep people on trail.

These trail needs must be balanced with minimizing trail widths and forest clearings to reduce the attractiveness to edge-oriented species that could displace or prey on sensitive corridor species. For example, wider trails are beneficial to the brown headed cowbirds who parasitize the nests of an endangered Southern California songbird, the least Bell's vireo; in least Bell's vireo habitat, it may be more appropriate to have multiple narrower trails instead of a single wider multiuse trail.

When possible, subtle means of behavior discouragement are preferable to restricting or eliminating access, but in highly sensitive areas restrictions, closures or fencing may become necessary to protect sensitive species and habitat. Interpretation and education of corridor visitors can play an essential role in maintaining the ecological integrity of the area. Visitors should be made aware of the value of the riparian corridor's sensitive natural resources, problems associated with certain discouraged behaviors, and how they can behave to minimize their impacts while in the corridor environment. Education can help the public to truly appreciate the unique environment they have access to, and may provide long-term support in the form of volunteerism and support for similar projects in the future (Smith and Hellmund, 1993).

Conclusions

The design and development of riparian habitat corridors is a complex and challenging undertaking. Many factors and issues must be taken into account, and consultants or experts on specific topics such as hydrology and wildlife biology may be necessary. But, despite the complexities of the planning process, the ideas behind corridor development are simple. Isolation of habitat is harmful to biodiversity, and riparian habitat corridors offer a means of connecting otherwise isolated habitat patches. As urbanization and suburbanization continue to spread through the landscape, a network of functioning habitat corridors between isolated habitat patches may very well prove to be the key to sustaining regional biodiversity over time.

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APPENDIX I

DESIGN CONSIDERATIONS FOR THE COEXISTENCE OF RECREATIONAL TRAILS AND WILDLIFE

By Katie Turnbull

As outdoor recreational activities continue to grow in frequency and spatial scale, so will pressures they place on access to open spaces historically populated by wildlife (Knight, 1995). Recreational activities and wildlife are typically not compatible without some form of overall management (Knight, 1995). The goal of management is to find balance between the benefits of creating access in open spaces and being stewards of nature, especially of wildlife (Hellmund, 1998). There is debate whether people should or should not have any form of recreational access near wildlife because of the direct and indirect impacts. It is important to recognize that strong political support for open space provisions stems from the public's desire and perceived right to experience wildlife (Knight, 1995). Trails offer opportunities to reduce the negative impacts that have degraded many of the open spaces where wildlife reside or historically populated. For example, a combination of recreation and wildlife management strategies provides management of access, environmental outreach to the community and initiates habitat restoration programs. By understanding the direct and indirect impacts that negatively affect wildlife and the motivations of trail users, appropriate planning, design and management decisions can then be implemented and evaluated for the coexistence of recreational trails and wildlife.

Negative Wildlife Impacts from Recreational Use

To assess the potential for interaction between recreationists and wildlife, recreational activities are classified as either wildlife dependant or nondependent. Dependant activities are contingent on the expected occurrence of wildlife in the area. Dependant activities are further classified as consumptive or nonconsumptive. Activities such as fishing and hunting are consumptive, while bird watching is nonconsumptive. Activities such as jogging and horseback riding are nondependent activities and are often enhanced by, but are not dependant on, the presence of wildlife (Knight, 1995).

When an area has little or no management for recreation, the wildlife will undergo either direct or indirect impacts. Direct impacts involve exploitation and disturbance. Exploitation involves immediate death from consumptive activities such as hunting, fishing or collection. Disturbance is either intentional, such as harassment, or unintentional from nonconsumptive activities such as bird watching or unintentionally hiking through an animal's territory. Indirect impacts involve habitat modification and pollution (Knight, 1995). Habitat modifications contribute to alteration of food supply and living spaces. Pollution results from a wide range of sources such as runoff and litter. Destructive consequences of all impacts include fragmentation of habitat, an increase of habitat edges, an influx of generalists and soil erosion. Indirect impacts differ from direct impacts because they are inevitable and they generally occur over a long period of time. Scheduling of recreational activities has less of an influence on indirect than on direct impacts. Management and design strategies that limit the amount, type and spatial distribution of use, as well as those that enhance site durability are strategic for managing indirect impacts. Management strategies that emphasize visitor education and temporal restrictions are more effective on direct impacts (Knight, 1995).

Recreational Planning

When working with complex issues such as recreation and wildlife, it is essential to plan at the regional scale and to study the wildlife habitat spatially and temporally. The goal with planning for recreation in open spaces is to avoid, minimize, and mitigate impacts. A planning framework developed by Noss and Cooperrider provides a framework for accommodating recreationists and wildlife while minimizing indirect impacts. The framework sets aside core biological reserves where human activities are limited and the maintenance of wildlife habitat and biodiversity are the primary goals. Surrounding the core are buffer zones, where increasing human impact- is allowed, while also supporting many species of wildlife. Outside of the buffer zones, land use is primarily human-oriented and only very human-tolerant wildlife species are present. Wherever possible, core reserves are connected by corridors that are also surrounded by buffer zones (Noss, 1994). Trails are kept to the outer successive buffers and occasionally go into core areas when appropriate (Hellmund, 1998). Managers and designers should consult with specialists such as the US Fish and Wildlife Service and the California Department of Fish and Game, who are able to provide information on areas of ecological sensitivity, critical foraging and breeding grounds, sensitive species, zones and standards.

Including the public in the planning

process is also essential. The large framework of laws and community desires determine what should be valued and protected (Hellmund, 1998). The various jurisdictions included in a recreation area need to be coordinated as well. For example, federal lands have their own environmental review process. An important process often overlooked is a monitoring program both before and after the trail construction. Programs monitor the wildlife population, evaluate and adjust for the negative impacts caused by recreational activities.

Trail Design for Reduction of Negative Wildlife Impacts

The immediate challenge is to design core reserves for wildlife as human populations continue to increase outside these core areas. When designing for the coexistence of recreational trails and wildlife, there are only rules of thumb based on experience, common sense and scientific literature (Hellmund, 1998). The most desirable trails designed for coexistence include a unique combination of management strategies. Trails have a zone of influence and the impacts vary due to species and season (Flink, 2001). A trail carrying capacity is not a direct relationship between amount of use and amount of impact. The amount and type of impact is influenced by the interrelationships of timing, type, distribution of use, setting and mitigation measures applied (Hammitt, 1998). There are different design strategies that should be used depending on the situation. Sometimes it is necessary to limit certain activities proven to cause negative impacts to wildlife, whether they are dependant or independent activities. Independent activities such as bicycling, horseback riding and dog walking can have negative impacts in particular instances. Zoning strategies allow these activities to take place in selected areas while restricting access near sensitive habitat (Smith and Hellmund, 1993). It is important for designers to consider the amount of area that will be cleared for a trail. The trail plus its thinned vegetation edges will result in approximately an acre of habitat loss per mile. A standard guideline is that multi-use trails impact their environment at least 100 feet on either side (Flink, 2001). Areas that are already degraded might be preferable for placing the trail rather than disturbing additional areas. Minimizing trail width and clearing size in the interiors of habitat areas reduces the attractiveness of trails to edge oriented species. Placing barriers such as brush or boulders is more attractive than fencing to keep people on the trail. Using signs also discourages diversions into habitat areas by trail users. If sufficient resources are not available to enforce trail closure during critical times, rerouting the trail is necessary (Smith and Hellmund, 1998). Native plants that provide food and shelter should be chosen for trail restoration projects. In order to prevent trail erosion on steep slopes, design switchbacks to run perpendicular to the direction of water flow (Smith and Hellmund, 1993). Water is a main contributor to the eroding of trails whereas trampling is a main contributor to the widening of them (Hammitt, 1998). Designers should use water-permeable trail surfaces as much as possible, and use concrete or asphalt in areas of intensive use.

Riparian areas are extremely sensitive because of their high biologic diversity. They are also attractive to people which contributes to their degradation. Plants in riparian soils are extremely vulnerable to compaction and soil erosion. To avoid volunteer trails in riparian areas, run the trail on topographic bench and lead in at key areas rather than continuously along riparian areas (Hellmund, 1998). Because they tend to be nodes for wildlife, trails should have a minimal amount of stream crossings and avoid stream confluences. While trails that encircle ponds or lakes are attractive to people, they should be avoided so that shoreline birds have to access water. Providing boardwalks in wetlands is a sensible way to allow access for people while decreasing the damaging effects. When designing boardwalks, minimize the footprint, use untreated wood and provide spaces between the wood planks for water and light to pass through (Thompson, 2000).

Trail Design for the Human Experience

While design for the wildlife is crucial, careful attention must also be given to the complexities of the human experience. Carefully orchestrated design enriches the user's enjoyment, reinforces their respect and modifies their behavior. Trails provide public recreational access to open space. The location of the trail gives direction and purpose to the movement of its users (Ashbaugh, 1965). When appropriate, spur trails divert users from the main trail. While most people will stay on the main trail, spur trails provide access to unique areas of interest such as wildlife viewing (Smith and Helmund, 1993). These areas are often ecologically sensitive and spur trails allow limited access rather than routing a primary trail through or along a sensitive area.

Before planning a trail, the designer needs to observe how people informally use the area. This will provide insight into their motivations and behaviors (Smith and Hellmund, 1993). People tend to prefer coherent areas with a bit of mystery through a sense of depth and opening. For trail users this opens views and increases the perception of safety,

whereas dense vegetation along trails tends to block the views (Kaplan, 1998). On the other hand, clearing the vegetation reduces the natural visual screening that makes most wildlife more tolerant of user disturbances (Hellmund, 1998). Fences, low walls and partitions provide orientation and cause the decision process of whether to pass beyond a particular location. These transition points are also effective when they are simply materials from the surrounding environment such as boulders or a contrast in the vegetation types and scale. When a trail is human scale rather than scaled for a vehicle, the width of the trail has an influence on the users sense of intimacy with nature (Kaplan, 1998). The impact of lighting areas for nighttime use must also be weighed. There are many studies stating that nighttime illumination affects habitat rhythms that are set by natural light and darkness cycles. If an area must be illuminated for safety purposes, there are devices and methods that reduce light from spilling into adjacent habitat (Thompson, 2000).

Interpretive design provides orientation, education and provocation. Information is usually communicated by signs, but other methods exist, such as visitor guides and leaflets. Orientating information provides a sense of comfort. People like to be convinced that the trail will lead them to where they want to go in order for continued exploration. It is helpful to use signs in places where people need to be kept out of sensitive habitat. Educational methods that aim to modify human behavior and diminish direct impacts on wildlife should be encouraged (Knight, 1995). Provocation encourages the visitor to think about the broader implications of the message. Themes are successful to communicate larger patterns in the landscape because people tend to remember themes but forget facts (Beck, 1998).

Sustainable Construction

Trail construction is often harmful to its surrounding environment. The building or restoration of trails needs to be carefully planned by managers and designers to minimize unnecessary damage to the environment. By analyzing the energy life cycle costs of materials and maintenance, a more sustainable trail is achievable. The practice of sustainable construction offers many tips for lessening the damaging impacts of trail construction. When surveying the site before design, use global positioning to minimize vegetation clearing. Designate areas to be protected by clearly citing them on all plans and in the field. Restricting the onsite stockpiling equipment prevents the compaction of soil and leaching of pollutants into the water supply. Temporary fencing on slopes and sediment curtains in wetlands prevents disturbance from construction. To reduce runoff and leaching of pollutants, trail surfaces should be made of porous and nontoxic paving materials. By specifying local materials, the overall transportation inputs to the site are minimized (Thompson, 2000).

Case Study

Chatfield State Park in Jefferson County, planners of Colorado developed a design and management program to minimize disturbances to the park's sensitive bird habitat, which are attracted to the park's water and native vegetation. The program focuses on spatial and temporal zoning, wildlife viewing access and environmental education. The main method for protecting birds at sensitive times is their zoning strategy. Users are only allowed to access the outer zone of the park during the bird's breeding season. During this season, parking is provided offsite and bicycles and horseback riders are only allowed access into the park to a limited depth. During the regular season, the spatial design is well programmed with physical design and supporting signage that keep people a safe distance from sensitive bird habitat. A variety of design elements were incorporated in the site to minimize human caused disturbances. There are select viewing areas along the water's edge where users are allowed access. Tangential trails were created rather than direct approaches to reduce the perceived threats by birds. Timbers of varying heights along the trail to the viewing areas were designed to disrupt human profiles. The existing vegetation was kept to block the views of the people. Positioning of the viewing deck is such so that its view is obscured by an embankment. The park does ongoing monitoring projects to assess the short-term and long-term impacts of the users (Knight, 1995).

Conclusion

While outdoor recreation activities are increasing at unprecedented levels, misuse may deplete the very natural resources on which they are based. Designing for the trail users experience and enjoyment, while at the same time protecting the wildlife habitat, is important to reducing and preventing the direct and indirect impacts caused by users. Through planning, design and management, managers and designers of outdoor recreation areas can minimize the negative impacts on wildlife while providing people access to today's limited open spaces.

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APPENDIX J

ALIGNING LANDSCAPE AESTHETICS AND LANDSCAPE ECOLOGY

by Wei Zhang

Designing landscapes for aesthetic purposes and for ecologically sound objectives involves some fundamental dilemmas. The artists and ecologists have separately created landscapes, which often become stages for the play of two ironic characters, aesthetics and ecology. We may differ in our feelings towards these two characters, but we are all experiencing the increasing conflicts between their oftentimes disparate goals. Today, the dramatic tension between these two opposing faces has never asked more loudly for resolution. Ecological issues can no longer be ignored, but rather, are being recognized worldwide as serious problems that must be addressed. This resolution will offer the possibilities for both hope and action:

- Hope that we can develop a new vocabulary of landscape design
- Action taken to maintain and sustain our essential bonds with the earth

The historic role of each character in the design of landscapes will be explored first. A new "combined" language addressing the needs of both factions will then be presented and discussed.

Aesthetic Character

We live mostly in response to surface appearance, both of the landscape and of life's events (Tuan, 1971). In the case of appreciation or response to the land and the landscape, surface values have always had great significance. Our bond with the earth has always been dependent upon them. Landscape painters and, more recently, photographers of scenic postcards and travel posters have played a significant role in shaping our aesthetic experience of the land's surface (Stilgoe, 1984). The National Park Service locates signs with camera icons near commonly photographed scenic spots in national parks. Many visitors to national parks never leave their automobiles, but seemingly enjoy an aesthetic experience entirely through their car windows. This superficial level of aesthetic bonds with the landscape seems satisfying and sufficient for many people.

Likewise, many of the aesthetic pleasures of life involve anticipating the possibility that an aesthetic experience might occur, and enjoying the surprises that this newfound knowledge might bring. In 1989, two researchers, Richard Chenoweth and Paul Gobster, had their students record all of their aesthetic experiences during a spring semester in their diaries (Chenoweth and Gobster, 1990). The researchers found that the students' aesthetic experiences were less frequent, more sudden, and more surprising than expected, and that their occurrences were unevenly distributed in space and time. The experiences were characterized as involving feelings of the triviality of the individual in an immense landscape, intensive assimilation in the event, newly discovered awareness and appreciation of environments, rebirth, and changing seasons. In summary, the authors wrote:

> Our results showed that aesthetic experiences tended to occur unexpectedly rather than being sought out by a person, occurred most often as a result of interactions with natural objects, and tended to occur in familiar places. Together, these findings suggest that opportunities should be provided for people to experience nature in their home environments as part of their everyday activities (p.8).

Aesthetic experiences are a type of fantasy in one's life. However, enjoying them may cause one to ignore the reality of the landscape, a reality that involves numerous variables and complex webs of interactions.

The picturesque, therefore, was and is, very dominant in popular culture. However, landscape aesthetics does not necessarily protect nature. The scenic landscape is often assumed to be ecologically healthy and cared for, an assumption that in many cases is not correct. For example, if we want to prevent a hill from eroding, the conventional aesthetic design would call for a retaining wall many inches thick to hold the earth in place. The extent of the design process would involve only choosing the materials and laying out the pattern of the retaining wall. Such a wall makes ostentatious use of materials, and may look aesthetically pleasing. However, this design solution does little to heal the land but rather, from an ecological point of view, only places a Band-Aid upon an open wound.

Ecological Character

The conventions and rules of aesthetics will have added power when placed in context with the underlying biophysical determinants (Hough, 1984). Hough advocates "a vernacular landscape whose aesthetic rests on its ecological and functional basis for form, and second, on the integration of design objectives" (Hough, 1984, 94). What is ecological design? Just as we feel more alive in a room open to sunlight and fresh air than one closed to the elements, E.O. Wilson speculates that we have an innate need for contact with a wide variety of species. Ecological design responds to this

need by bringing a fundamental awareness of natural processes and interactions into the urban context. Ecology is the science of inclusion and connection rather than of isolation and individual analysis. Ecological design provides a coherent framework for adapting to and integrating with natural processes. This design approach addresses the issues of energy, water, food, manufacturing, and waste systems in the construction of new landscapes, buildings, and cities. This approach makes natural processes active at diverse levels of scale from the household to the neighborhood to the entire city. It compels designers to ask new questions during each design decision: Does it enhance and heal the living world, or does it diminish it? Does it preserve relevant ecological structures and processes, or does it degrade them?

With the arrival of growing ecological awareness in the past 40 years, we are just beginning to make the transition from surface-focused landscape consideration towards functional connections between organisms (both human and others) and contexts. There are now sewage treatment plants that use constructed wetlands to simultaneously purify water, reclaim nutrients, and provide habitat for wildlife. There are agricultural systems that imitate natural ecosystems and also merge with their surrounding landscapes. There are new kinds of industrial systems in which the waste streams from one process are designed to be useful inputs to the next, thus minimizing pollution. Such examples are becoming more numerous.

These examples show that we need to think differently about design. Ecological processes should be utilized to guide and inspire design solutions. For instance, certain plants have been found to be particularly effective at removing pollutants from the air. They can be utilized for providing both an aesthetic solution and also an effective air purification filter within office buildings. Let us look at the example of the retaining wall again. The conventional way of building a retaining wall to support a badly eroding hill is not adapted or integrated with the natural process of the earthwork. In looking for an ecological design solution, we can perform the same function by seeding the hill with hundreds of willow branches. Within months, the branches sprout providing effective soil stabilization. The willow's articulated roots are far more adapted to keeping the soil in place than a concrete, stone, or wood retaining wall. Ecological design is a design with a deep care; care of soil, vegetation, animals, climate, topography, water flows, and people.

To the general public, ecologically sound landscape often means less fun, fantasy, and imagination. Fantasy and imagination are necessary for human survival, and there is much room in the ecological world for both. In recent years of landscape practice, the artist and ecologist have begun working together to integrate landscape aesthetics and landscape ecology. By making nature visible, fantasy is being embodied in reality. Ecology, which underlines any landscape, must be kept in mind. Nevertheless, ecological landscapes need not be a purely and rigorously scientific. Such spaces, especially those close to urbanized areas where most people live, should be aesthetically appealing. If we expect the public to enthusiastically reorganize its environmental and landscape design preferences, the ecological landscapes themselves should engage public interest and motivate support for their expansion and replication. This is vital to the promotion and acceptance of ecological design (Nassauer 1997).

Combined, New Language

Ecological processes, however, are often invisible and may take place within a time frame or under circumstances not conducive to human comprehension. We need a new design to help us literally "make sense" out of the unseen. Bringing core ecologies to the surface will be the challenge for landscape artists and designers. The ability to see into and understand the inner ecological processes of a landscape is essential, especially in a world where more and more of the technology controlling our lives is invisible and incomprehensible to the average person. As humans, we would like to know and have a right to know where we are, how we are connected, and how we are doing. Without being able to see into the workings of our own landscapes, we may be unable to make the necessary adjustments to changing environmental conditions.

How can we align aesthetics and ecology in design of the landscape? Making nature visible is a way of reacquainting ourselves with the wider communities of life, but it also informs us about the ecological consequences of our activities. In Cities and Natural Process (1995), Hough emphasizes "the notion of visibility," uncovering the myriad of hidden processes that make cities work (Hough 1995, 30-31, 83). With conventional storm water drain systems, for instance, water quickly disappears into subterranean arteries picking up various toxins along the way. The water is hidden, and so are the impacts of the system itself – contamination of downstream rivers or wetlands, altered hydrology, and decreased groundwater recharge. We can make the drainage system both

visible and ecologically functional by letting water flow on the surface into drainage ponds. We can preserve wetland and stream corridors to store storm water. People love to watch this process in action. All of this suggests a new kind of aesthetic for the built environment, a "knowledge based aesthetic" (Nassauer, 1997). Such an aesthetic will teach people about the potentially symbiotic relationship between culture, nature, and design. Making nature visible is a powerful approach, since new ideas are learned most rapidly when they are expressed visually and experienced directly. The landscape architect Robert L. Thayer, Jr. has called this aesthetic "visual ecology functional deliberation".

One way to communicate the ecological function of the landscape is to embrace the social nature of our landscape perception. If we probe the social language of landscape form and learn the conventions of landscape appearance, we can use these conventions to label ecological function. This general design principle marks ecological function with socially recognized signs of human intentions for the landscape. This is accomplished by providing expected characteristics of landscape beauty side by side with characteristics of ecological health (Nassauer, 1997). For instance, water more than any other element of the landscape, has deeply rooted spiritual and symbolic meanings. As an element of great experiential power, water has historically been manipulated and shaped to create places of delight and beauty. Water has reflected cultural attitudes towards nature. The Romans celebrated extravagance through the use of the water in their engineering and architecture. The great Italian water gardens celebrate water in its volume, light and the sound of its flow. The Japanese celebrate tranquility by using water elements in their traditional garden designs. The task today is to create a new design symbolism for water that reflects the hydrological processes of the city; an urban design language that re-establishes its identity with life processes.

An opportunity exists within sewage treatment plants to establish a vernacular landscape whose aesthetics rest on the ecological and functional basis of nature. In Toronto, Canada, an artistic expression of the storm water runoff catch basin and drainage swales has been created in a city park. This design educates people about a part of the water cycle and reminds them where the water goes. At the Rudolf Steiner Seminariat, Jarne, Sweden, the designer of the Sculpture Garden of the Sewage Treatment Plant created flowform sculptures for detoxifying the sewage water. Sewage water cascades down various sculptured basins and is aerated as it drops. The design is not only aesthetically pleasing, but also hydrologically functional.

Integrating aesthetics and ecology by making nature visible has been practiced successfully from humanized form to natural-looking wetlands in other parts of the world. An awarding winning project, the Living Water Park in Chendu, China, isss a pilot project of aesthetic visual ecological landscape design within China. In the project, the designers incorporated the regional landscape with the local environment to demonstrate natural processes for cleansing water. The city has also been provided with a new access to its river (Lyndon,2000). Living Water Park is part of the endeavor by Chengdu, a city of nine million, to reclaim its river, a river which life and prosperity have historically depended on. In 1992, Chengdu constructed flood control and treatment facilities, relocated 100,000 residents to new and modern housing, and created approximately fifty miles of new public waterfront with gardens and parks. This project was instigated following the recent passage of China's largest comprehensive water quality initiative in modern history. The project was a joint effort of designers, scientists, and engineers.

Living Water Park is located within this open space system, and serves as an educational and inspirational model. This park demonstrates how water can be cleansed through biological processes. The Park also reveals the spiritual connection of the Chinese people to water within an urban location. The design includes reclaiming polluted river water through a series of aeration surfaces; constructed wetlands and water features that enable people to view how these natural processes can remove pollutants from the river. Visitors can walk down to the river along terraces, wander along the riverbank, or sit in an amphitheater on the river's edge.

The main element is a system that filters river water through natural means and runs within the length of the park (about 1,500 feet). Water is pumped in, emerges through a fountain into a settling pond, and then gushes along a series of flow sculptures. During this process, the water is exposed to the atmosphere and partially detoxified. The water next drains into constructed wetlands and fishponds, and finally returns to the river. In the design, people can view the water as it is purified in ponds and filtering channels, and watch it return to the river. Therefore, the system reveals the natural functions of the river cycle and hints at the original landscape character of the river.

The Real Goods Trading Company's Solar Living Center in Hopland, California is another example where ecological design is linked to visual aesthetics. This site consists of twelve acres on an agricultural floodplain and serves as a demonstration landscape and garden to inform people about the company's products and its ecological vision. The design offers strong possibilities for making natural processes visible. The silted, damaged stream on one end of the site is being restored to reflect its original riparian qualities. Constructed wetlands, ponds, and gardens fill the floodplain. The landscape design imitates the original variety of plant communities found in the area. The planting plan is spatially related to the seasons, and provides clues of the design's orientation to the sun's daily and seasonal paths. Water recycled from an on-site aquifer is a major element in the design. This water provides summer cooling for outdoor spaces, soothing background sounds, and an animated path for visitors to follow. The design is a complex interweaving of communities; it is not only favorable for humans, but also favorable for plants and animals (Bennett, 2000).

The whole site is full of visually pleasing living sculptures that reflects ecological functions, the company's vision, and the designer's ethical positions. "The memorial car grove is a testament to the gas-guzzler of yesteryear" (Bennett, 2000). It is the most controversial of the works, angering local officials who complained that it was junk and not art. It consists of five old cars, cut through the bottom and planted with poplars. The grove sits on Highway 101 and serves as an advertisement for the center. As the designers describe, "It is a fitting monument for a business whose mission is the elimination of fossil fuels." The drip ring, supporting a canopy of cottonwoods, is another living sculpture. Integrating wire and metal sculptural frames with fast-growing plants, this sculpture is a "riff" on traditional garden follies. Like traditional follies, the drip ring's purpose is to direct our view to the landscape. In this particular case, visitors are asked not only to enjoy the structures but also to understand the natural processes that created them (Bennett, 2000).

In some sense, visual ecology projects have certain commonalities. They have the same vision of form follows function (Lyle, 1994). "Function" is an ecologically based order. "Form" follows function, a changing notion of the underlying interrelationships of nature, and will be expressed on the surface in a unique way by different cultures. New forms of landscape seek to reveal ecological order through the interplay of both surface aesthetics and ecology to both culture and place. As our understanding of the natural world continues to grow, the representation of newly discovered natural functions will result in the continued evolution of new innovative design solutions.

Conclusion

Visual ecology will help us to reduce the tension that exists between the visual qualities of landscape designs and the underlying natural functions. Visual ecology allows us to see, understand, and appreciate nature. At the same time, this design philosophy will allow the representation of a landscape that relies on local resources, celebrates local cultures, and preserves local ecosystems. Visual ecology provides an alternative landscape design where the natural process is dominant, and presents an entertaining, simulating landscape where essential life functions are undertaken, revealed, and celebrated. In addition, visual ecology represents a landscape that relies on local resources, celebrates local cultures, and preserves local ecosystems.

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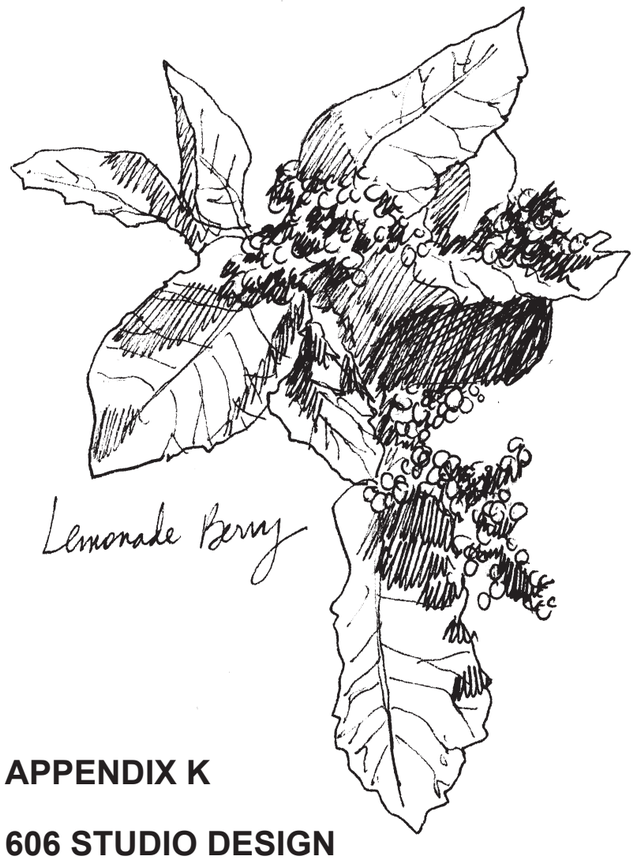
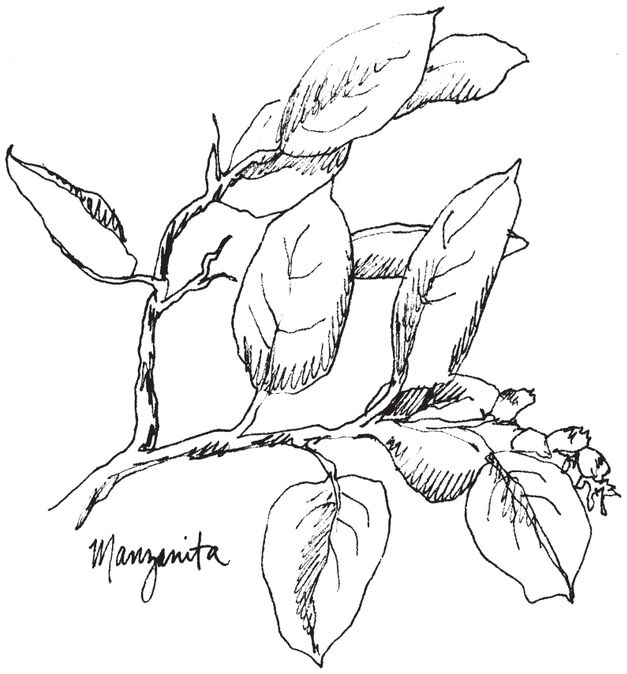


APPENDIX K

606 STUDIO DESIGN PROCESS

The 606 Studio is a group of third-year landscape architecture graduate students and faculty at California State Polytechnic University in Pomona. The studio focuses on the application of advanced methods of analysis and design with particular emphasis on preservation and restoration of sensitive natural systems. Projects address serious, important ecological, social and aesthetic issues related to urban, suburban, rural and natural landscapes. They generally result in conceptual or specific plans, schematic site designs, land use plans or land management strategies.

Teams of third-year graduate students and members of the graduate faculty carry out the projects. Working with the direction and continuous participation of the faculty, graduate students perform the tasks of research, analysis, planning and presentation. The academic studio environment offers a unique opportunity for graduate students to explore issues and possibilities at a variety of levels. Because of its function within an academic institution, the 606 Studio must maintain academic integrity, advance the state of the art and demand that projects have a strong, practical base, as well as display technical and professional expertise. Projects undertaken by the 606 Studio are expected to satisfy the following criteria: they must address significant issues concerning resources and the physical environment with broad implications beyond the boundaries of the project site and they must promise to result in significant benefits to the general public. Projects should be complex; requiring application of advanced methods beyond those routinely used in the field. Sufficient time and support must be available to explore all promising approaches, to do a thorough job and to communicate the results clearly and completely. The results must become public information.



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